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BRITISH MEDICAL JOURNAL

LONDON SATURDAY AUGUST 1 1959

THE OCCASIONAL OBSTETRICIAN*

BY

A. M. CLAYE, M.D., F.R.C.S., F.R.C.O.G.

Professor of Obstetrics and Gynaecology, University of Leeds

I am grateful to the British Medical Association for suggesting to me an alliterative title for a subject which is decidedly topical. I love my love with an O because it is Obstetrics—some people find it objectionable or even odious, which I consider odd. A distinguished visitor who discussed the subject in my presence rather frivolously suggested it might be obscure, obscene, or even obsolete. Was he perhaps thinking of a "Brave New World"? I think, myself, he was obsessed with O.B. Surely for interest it is outstanding and overshadows all else in medicine.

I am proud to have been asked to speak in a district within the sphere of influence of the South-West of England Faculty of the College of General Practitioners. I have read more than once with great benefit and enjoyment their obstetric survey. As I did not wish for the purpose of this talk to be biased by the Cranbrook report, I took the precaution of putting it together before the publication of that document, and at the moment of writing I knew very little of what it was likely to recommend. But I have now read it, and so I am inserting at appropriate points the comment of the report on any particular subject after my own. It is my belief that the obstetric service of this country would be better if the general practitioner played a greater part in it. He does so to a greater extent in this area than in my home city of Leeds, where 70% of the births take place in specialist hospitals. The writer of the introduction to the survey states, with some justification, that "it is not to be expected that the specialist who sees most of the failures and few of the successes will have a balanced outlook on general practitioner obstetrics." However, many of my relations are, or have been, general practitioners, and I have had instruction calculated to help the balance of my outlook.

It is no good practising obstetrics unless you do a fair amount of it. If I may be allowed to utter a shameless platitude, the man who does a good deal is likely to do it better than the man who does only a little. He will get more experience in the necessary manœuvres, and more of the thrills which attract me to it. I quote Nixon and Hickson: "The virtual abolition of the private maternity case has led to fewer cases being attended during labour by general practitioners. This is a retrograde step. To realize when something is going wrong, it is necessary to have seen a large number going right." In the survey there were about 30 deliveries under the care of each doctor during the year; and 48% of all deliveries, or nearly 15 of the 30, were attended by the doctor. One or more visits were paid by the doctor during labour, but not necessarily for delivery, in an additional proportion of cases, varying in the different classes (primiparae and multiparae, home, G.P. hospital, and nursing-home deliveries) from 4 to 20%.

This average of 30 a year seems to me more than occasional and gives adequate experience—more, indeed, than that of their midwife colleagues (I quote) "employed by county authorities, many of them, working in rural areas, who average only about 20 cases per annum."

The General-Practitioner Aspect

The Royal College of Midwives has expressed its views on what it expects of general practitioners. In its evidence to the Committee on General Practice under the Health Service in 1951 it stated: "General practitioners undertaking maternity medical services should have recognized obstetric experience." In its evidence to the Cranbrook Committee, kindly provided for me by Miss Mary Williams, its president, a little more is said. "Midwives did know from their own experience that they could have confidence and expect real co-operation from doctors who had held postgraduate hospital appointments or obtained postgraduate qualifications, and from other men who, though they might not have the qualifications, had done a great deal of domiciliary midwifery over the years, and had acquired a high degree of experience and skill."

The Royal College of Obstetricians and Gynaecologists, I find, is often mistakenly supposed to be the enemy of the general practitioner in obstetrics. This I think may be based on the statement in the College 1954 report on the obstetric service about the obstetric lists. It reads: "There must be some form of selection based upon a greater practical experience than can be provided in the undergraduate curriculum, and all entrants to the obstetric list should have held a six-months resident obstetric appointment after qualification." Paragraphs 349 to 352 of the Cranbrook report run:

> 349. The practice of obstetrics requires special skill and experience. There is not enough domiciliary maternity work available to enable every general practitioner to obtain and maintain the necessary standard of skill. (Paragraph 192.)
>
> 350. The obstetric list should be continued. More uniform criteria should be applied for admission to and retention on it. (Paragraphs 193 to 197.)
>
> 351. A six months' resident appointment in an obstetric unit under the control of a consultant obstetrician should be the normal criterion for admission to the obstetric list. (Paragraph 195.)

*A B.M.A. Lecture given to the Trowbridge Division on April 23, 1959

352. In order to remain on the obstetric list, which should be reviewed every three years, a doctor should, over the preceding period of three years, have had at last 60 complete booked cases, of which he should have attended deliveries of at least half. (Paragraph 196.)

Unquestionably if the conditions for the list were tightened up, the stricter conditions should apply only to new entrants. Paragraph 201 of the Cranbrook report stated: "The present obstetric list should be accepted as it stands. . . . G.P.O.s should fulfil the criteria for remaining on the list at the first review, which we recommend should occur at the end of three years." The College report already cited also stated: "Beds for uncomplicated cases should be provided in general practitioner hospitals or homes in close integration with the main obstetric units." One of our important general principles has always been that the doctor responsible for the antenatal care must also be responsible for the labour. In our evidence to the Willink Committee we stated: "It is anticipated that the total number of institutional births might increase to 90% (that is, from the present 65%). . . . It is probable that this increase will be mainly in general practitioner beds . . . staffed by general practitioner obstetricians." Cranbrook report paragraph 258 remarked: "The extra beds required to enable the hospital confinement rate to be raised to the suggested average of 70% of all confinements should where possible be general practitioner beds."

The doctor who makes the minimum number of examinations, two antenatal and one post-natal, needed to qualify for the fee for maternity services, is certainly an occasional obstetrician. But in mentioning this I know that I am flogging a dead horse. Nearly two-thirds of all the patients dealt with in the survey were examined seven or more times. What its writer described as textbook antenatal care involves a dozen examinations, if the patient books at about 10 weeks. The frequent examinations in the later weeks are based largely on the necessity for making the diagnosis early if pre-eclampsia develops, for if it is so diagnosed it seldom becomes serious. Paragraph 211 of the Cranbrook report begins: "We consider that it is unnecessary for us to define precisely the content of antenatal care, but we agree that only two antenatal examinations by a doctor are inadequate." One of the ways in which the obstetric patient often suffers is by falling into the hands of too many authorities. She may indeed suffer more in this way if she is being confined in a specialist hospital. But if she is in the hands of her own doctor, the midwife too is expected by her Board to make antenatal examinations.

The notices concerning a midwife's code of practice in the handbook incorporating the rules state that "when engaged to attend a confinement a midwife must . . . carry out such examinations of the patients as are necessary, or see that they are carried out." It is very desirable that the patient should not be badgered. When possible—and I know that because of the nature of midwifery this is sometimes difficult—the midwife should attend the doctor's examination, and make hers on that occasion. This enables the two of them to consult, and facilitates their speaking with one voice, which does not always happen when the examinations are made on separate occasions by doctor and midwife. In the last two sentences in paragraph 211 of the Cranbrook report we find: "We think that it is impracticable to recommend that the general practitioner obstetrician and the midwife should always see the patient together, but consider that there should be the closest co-operation between them. We suggest that antenatal examinations should not normally be given in the ordinary surgery session."

Our Set Ways

The occasional obstetrician is a good deal less likely to be up to date in his methods than the man who has a sizable obstetric practice. I cannot imagine that one who spends only a minute fraction of his time on practical obstetrics will think it worth while to allot further time for reading about the subject or attending discussions or addresses. So he may be unaware of the extensive use of episiotomy with forceps delivery or without it, of local analgesia for forceps delivery, breech delivery, and repair of the perineum, and of the use of ergometrine during delivery of the child, and so on.

We are all of us conservative, and change our set ways with reluctance. The specialist is less conservative than the family doctor, who I believe in his turn is less conservative than the midwife. I do not find this surprising for it is natural that new methods should be tried out first in hospital, and come to be used in general practice when they are established. The process of filtering through sometimes takes rather a long time. Consider episiotomy. When used before forceps delivery it is described in the survey as a "relatively recent innovation." What that means depends on relatively to what. I was a resident officer in obstetrics in 1926–7–8, and at that time used it whenever extracting the head with the occiput behind, and occasionally with the occiput in front if tearing seemed inevitable; also for all primiparous breech deliveries. But it was not new then. Still less is it new now, though it is used more extensively than heretofore. In my view my registrars and house officers tend to do it too often. No doubt I am becoming conservative or old-fashioned myself.

Very few forceps deliveries in hospital escape episiotomy nowadays, though it *is* possible to deliver many primigravidae without it, without laceration, and without condemning them to subsequent prolapse. Many second stages are rightly shortened by episiotomy when the head is low, without the need for forceps delivery, and the risk of the premature baby's suffering intracranial haemorrhage is reduced by the performance of the operation. But *you* should not have to use this last indication often, for when the patient goes into premature labour before 36 weeks her baby's chances will be best if she is delivered where there are special facilities for prematures. As the Cranbrook report paragraph 238 says, "We consider it most important that a mother in premature labour should if practicable be transferred before delivery to hospital which has a premature baby nursery."

One of my informants about general practice tells me that obstetrics is "one of the easiest branches" of such practice. There is difference of opinion about this, and it depends a good deal on what is meant by easy. Attendance at delivery is certain to involve some night work, which is not "easy" in one sense of the word. I know I am not alone in thinking that the responsibility for a normal case almost invariably involves anxiety for the obstetrician at one or more moments between the

booking early in pregnancy and the conclusion of the case after the post-natal examination. Anxiety is un-easy. And surely the ease depends to a very great extent on the amount of experience one gets.

A Joint Responsibility

From what I have already said you may have gathered that I think the doctor should be present when the patient is delivered. When I was in private practice I always tried to see my patients at least once in the early part of labour, and to be present at delivery. With occasional exceptions I used to deliver the patient myself. I have the feeling that the doctor ought to be able to deliver the baby normally at least as well as the midwives with whom he works, and this needs practice. On the other hand, it is more important for him to be present than to conduct the delivery, and he can sometimes be usefully employed giving an anaesthetic. I am going to mention local analgesia in a moment. The first three sentences of paragraph 212 of the report run like this: "We are of the opinion that a general practitioner should, whenever possible, attend all domiciliary confinements, to safeguard the mother and the baby against unforeseen emergencies, to give the patient confidence, and incidentally to maintain his experience. Ideally, he should visit early in labour and then be present for the delivery. The conduct of a normal confinement is the joint responsibility of the doctor and midwife."

The birth of the baby is the climax to which the many months of pregnancy lead up. It is proper—indeed there are doctors who find it a thrill—that the man who has prepared the patient for the event should be there when it takes place. I appreciate that a phenomenon such as an influenza epidemic may well prevent the doctor being present.

Techniques

May I say a word or two about the techniques needed in normal and near normal obstetrics? I have already mentioned episiotomy. To use this operation it is also needful to be able to give local analgesia; and for low forceps delivery, another necessary technique for the general practitioner obstetrician, to do a pudendal block. "Difficult" is another of these words with no absolute meaning, but I would not use it about local infiltration of the perineum or about pudendal block. The main reason why they are not more used in general practice is the conservatism to which I have previously alluded. However, more doctors to whom the techniques are familiar are going into practice each year, and no doubt they will be more and more used. The important points in their favour, you will remember, are: (1) they have no adverse effect on uterine action; (2) they have no adverse effect on the establishment of the baby's respiration; and (3) they make an anaesthetist unnecessary.

The carrying out of the usual medio-lateral episiotomy is easy, though it is often done incorrectly. Its repair, however, is another matter. I can compare it with another operative procedure that I frequently carry out—namely, posterior colpoperineorrhaphy for rectocele. The repair of an episiotomy is in my view a slightly more difficult operation than that. The reason for this is that when the episiotomy incision has been made, the muscles divided pull on the two sides of it unevenly. It needs some care, therefore, to bring corresponding points on each side of the incision together, and to obliterate all dead space, so that the parts come together as nearly as possible as they were before the incision was made.

The incidence of low forceps delivery has greatly increased in recent years. It is being realized more and more that a long second stage may be harmful by stretching unduly the soft parts at the outlet. It is recognized, too, that it is safer for the baby to be born before it has experienced distress, rather than after that has occurred. It is likely that the incidence of forceps delivery given in the South-west Survey—15.4% of primiparae, and 3.4% of multiparae in doctors' confinements—is lower than the ideal. Apropos of what I have just been saying, the survey states—and I do want to stress this—that where "attendance at the confinement has been delegated to midwives, forceps delivery was relatively uncommon; but when it became necessary, a long second stage was more frequent and more babies were lost." Sometimes, though the head is visible, it is not the bony skull that is low, but the caput succedaneum which is large. Such a case is more difficult to deal with, and it is important that it should be recognized. The doctor can then either deal with it himself, if he feels able to do so, or obtain expert help.

By the way, there may be some who think that an average of 20 cases a year is too large to insist on. But consider the implications relating to forceps delivery. If your forceps rate is 20%, which is probably a reasonable figure, you will apply forceps four times a year. I do not think it can justly be said that this amount of practice is excessive. The implication relating to total deliveries is that the doctor will have the opportunity of attending one every 18 days. This also does not strike me as excessive.

You may take the view that it is a misuse of the word "occasional" to apply the term to an obstetrician who will not take obstetric emergencies, will not apply forceps, do a breech delivery or a manual removal. It *can* be said of such a man that he selects the occasions on which he is prepared to undertake obstetrics, and so is occasional in that sense. This was the position of some of the deputies in the survey. I need hardly say that if the patient is liable to fall into the hands of someone who will not do this, that, or the other manœuvre which may prove necessary, and *she* knows it, she is not likely to be full of confidence about the event. If she does not know it, and such a deputy is called, an unfortunate situation develops at a time when she thought all was arranged and tidy.

Manual Removal and Breech Delivery

Manual removal is the procedure which figures at the top of the list relating to deputies: 14% of doctors had no deputy for manual removal. Now manual removal is a simple procedure, much simpler than the average low forceps delivery. The taboo on it is a survival of the days when it carried a maternal mortality of 2%. The main reason for this was that in those days, from fear of infection, it was often delayed until the patient was collapsed, and the operation killed her. When it is done on a patient in good condition it is a very safe procedure.

Breech delivery is another matter, and the results vary very much from person to person. I well remember in my own hospital some years ago when

we had two registrars at the same time who had not the knack of it. The first consideration is to prevent it happening by doing external cephalic version. The next point is to refer to a specialist the few patients in whom turning cannot be achieved, if the doctor does not wish to undertake the breech delivery. That leaves those in whom the diagnosis is not made before labour. There is still a chance that the condition may be diagnosed early in labour, so that if it is desired the patient may be transferred to a specialist hospital. If it is not diagnosed until delivery is starting, the doctor will have to deal with it himself, so that he should have some idea of what Tristram Shandy called "the plain principles of the business." The higher the proportion of successful external cephalic versions the less the experience in breech delivery. And, I should say, a very good thing too. The evidence is that breech delivery is no less dangerous in a multipara than in a primigravida.

Conclusion

I am afraid that I have not kept strictly to my subject throughout. This is probably the result of browsing in *Tristram Shandy*, which sets a shocking example in the matter of digression.

There are at least two types of experience in life, one of which it is more blessed to have occasionally. If I lived in the Lake District, and when I looked out of the window in the morning and could see on every clear day Helvellyn and Catchedicam, I might well soon become unconscious of their presence. But when I see them once a year or less, I get a fresh thrill every time. If I could follow the example of Horatio Bottomley and drink champagne every day for lunch, its fascination might well soon pall. As Shakespeare put it:

> So am I as the rich, whose blessed key
> Can bring him to his sweet up-locked tressure,
> The which he will not every hour survey,
> For blunting the fine point of seldom pleasure.

But for experiences that demand technique, like playing bridge or lawn tennis, or practising surgery or obstetrics, practise tends to make perfect or at any rate better, and gives one a sense of pride in achievement.

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TREATMENT OF TETANUS NEONATORUM WITH INTERMITTENT POSITIVE-PRESSURE RESPIRATION

BY

P. M. SMYTHE, M.B., M.R.C.P.

AND

A. BULL, M.B., F.F.A.R.C.S., D.A.

From the Departments of Paediatrics and Anaesthetics, University of Capetown, and Groote Schuur Hospital, Capetown

Tetanus neonatorum has always carried a high mortality. In the past six years 40 cases have been admitted to Groote Schuur Hospital and only one survived. Many of these infants appeared to die of respiratory failure because, by giving intragastric oxygen, life could at times be prolonged for up to 24 hours after breathing had ceased. This fact, coupled with the successful treatment of tetanus in older patients with intermittent positive-pressure respiration (I.P.P.R.), inevitably led us to consider the application of I.P.P.R. to these infants. The only model of the Radcliffe pump (Russell and Schuster, 1953 ; Smith *et al.*, 1954) available to us is not, however, designed to deliver the small tidal volumes encountered in neonates. The youngest child treated with I.P.P.R. recorded in the literature (Lawes and Harries, 1956) was aged 10 months and died with surgical emphysema of the lung and a pneumoperitoneum. In this paper is described a simple modification of the Radcliffe pump and its application to the first nine cases of tetanus neonatorum to be treated with I.P.P.R.

The two defects in the standard Radcliffe pump and Stott valve mechanism when applied to infants are the high percentage of the tidal volume which is constituted by the dead space lying between the valve and the patient, and the inefficient activation of the Stott valve by the small expiratory volume of the infant. These defects were overcome (Fig. 1) by increasing artificially

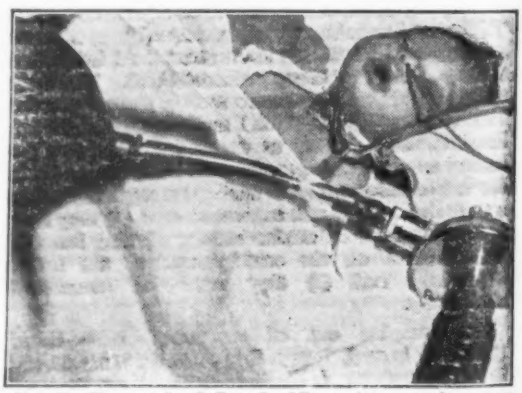

FIG. 1.—Photograph of Case 8 while on intramuscular curare, showing how the Radcliffe respirator was adapted for use in infants. The rubber tube connected with the Y-piece is joined to the manometer.

the tidal volume on the patient's side of the valve. To do this a rubber bag of some 300-ml. capacity (a B.L.B. bag proved satisfactory) was attached to the larger opening of the delivery arm. To the narrower side-arm

was attached a Y-piece, one arm of which was connected to the tracheotomy tube, the other to the manometer. With this arrangement the inspiratory stroke of the pump inflates the bag rapidly, and a smaller volume of air is delivered to the patient, whose lungs become inflated almost at the same time as the bag. On the expiratory cycle, the air from the distended bag and from the infant's lungs passes out via the expiratory side of the Stott valve. The large volume of air plus the elastic recoil of the bag activates the valve very efficiently, and, by dilution, greatly reduces the effect of the dead space in the delivery arm. The only complete dead space is from the side-arm to the endotracheal tube. The inspiratory pressure can be varied according to the weights placed on the bellows of the pump and the tensile strength of the bag.

Eight infants in this consecutive series were Coloured and one (Case 2) was European. Their brief case histories follow.

Case 1

A female infant 4 days old was admitted on July 12, 1957, to the Red Cross War Memorial Children's Hospital with tetanus. A.T.S., sedation, and penicillin were given, but in the next 24 hours she deteriorated markedly and was transferred to Groote Schuur Hospital for I.P.P.R. While being transferred she stopped breathing and had to be Eve-rocked by the nurse in attendance. On arrival she was grey and cold (rectal temperature 86° F.—30° C.), with a slow feeble pulse and breathing only with occasional gasps. An endotracheal tube was passed and I.P.P.R. was started. Spasms were controlled with paraldehyde and luminal. After 15 days of I.P.P.R. the first sign of returning consciousness was observed in that her eyelids contracted to a bright light shone in her face. At this time spontaneous breathing appeared to be adequate, so a tracheotomy was done. This was associated with a second severe anoxic episode. On the 29th day a third anoxic episode occurred when the tracheotomy tube became obstructed. By the 40th day feeds were being taken normally from a bottle. On the 49th day, just when removal of the tracheotomy tube was to be attempted, the child died suddenly and unexpectedly.

At post-mortem examination the brain was shrunken, with atrophic gyri, and on section showed extensive cystic areas of softening. These changes were interpreted as being due to cerebral anoxia.

COMMENT.—This, our first case treated with I.P.P.R., is the subject of a further communication. The length of survival was greater than had been anticipated, and indicated the need to start I.P.P.R. before irreparable anoxic damage had been done to the brain. With the possibility of an infant surviving, prolonged endotracheal intubation was undesirable. As no small cuffed tracheotomy tube was available an alternative was devised as described later.

Case 2

An infant aged 6 days was admitted to hospital on October 25, 1957, with tetanic spasms, which had started the previous evening. Tracheotomy was done under general anaesthesia. Spasms were partially controlled with paraldehyde, 1 ml. four-hourly, and phenobarbitone, ¼-gr. (16 mg.) six-hourly. The following morning breathing became increasingly shallow, and when cyanosis occurred with apnoea I.P.P.R. was started. In the evening hypothermia (temperature 87° F.—30.6° C.) and flaccidity developed. The heart sounds were faint. The infant was warmed and given digoxin, and all sedatives were stopped. On October 27 spasms recurred, and deterioration and death rapidly followed. The terminal E.C.G shown in Fig. 2 was taken because of the difficulty in ascertaining whether the child was still alive. At post-mortem examination nothing abnormal was found.

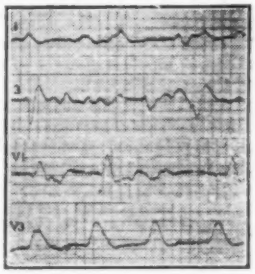

FIG. 2.—Case 2. The electrocardiographic pattern is that of the "dying heart." Auricular activity is absent; ventricular rate is irregular, varying from 45 to 60 a minute; gross widening of the QRS complex is present

Comment.—This case ran a fulminating course. There was a delay in starting I.P.P.R. and hypothermia was allowed to develop. Relaxants would have been tried had Case 1 not responded to sedation alone.

Case 3

An infant aged 8 days was admitted to hospital on November 18, 1957, with tetanus. Tracheotomy was performed under general anaesthesia and I.P.P.R. started soon after admission. Following this the child appeared to be unconscious. Mephenesin 1 gr. (65 mg.) hourly, and phenobarbitone, ½ gr. (8 mg.) six-hourly, controlled spasms. Consciousness returned on the third day and spontaneous breathing out of phase with the pump on the fifth day, so I.P.P.R. was stopped. Feeds were taken from a Bellcroy feeder on the 19th day and subsequently from a bottle. All sedation was stopped by the 35th day. The infant was now normal in every respect except that repeated attempts to remove the tracheotomy tube were unsuccessful. On the 45th day a staphylococcal tracheitis developed which failed to respond to treatment. The child died three days later.

Post-mortem examination revealed a flap of granulation tissue hanging down from the upper edge of the tracheotomy wound into the lumen of the trachea and capable of obstructing the airway. Thick mucopus occluded the trachea and main bronchi. There was one small area of segmental pneumonia.

Comment.—This infant had recovered from the tetanus, and had it not been for the tag of granulation tissue preventing establishment of normal breathing, complete recovery would probably have followed.

Case 4

An infant aged 4 days was admitted to hospital on November 30, 1957, with tetanus. At the time of admission the infant had a heavy discharge of pus from the nose from which a pure growth of *Klebsiella pneumoniae* was grown. Early tracheotomy under general anaesthesia was followed by I.P.P.R. Consciousness was not regained. Spasms were controlled with mephenesin, 100 mg. hourly, and phenobarbitone, ½ gr. (16 mg.) t.d.s. by stomach tube. During the second night, in error, mephenesin was not given and severe spasms occurred, the pulse rate rose to 200, the pupils failed to react to light, and muscular flaccidity developed. No stools were passed during the illness and the abdomen became increasingly distended. There were occasional vomits. On the fifth day gastric suction, together with an intravenous drip of curare and oxytetracycline, was started. On the seventh day the child died. A blood culture done immediately after death grew *K. pneumoniae*. Post-mortem examination revealed extensive focal necrosis of the liver due to the septicaemia. The trachea, bronchi, and lungs showed no disease.

Comment.—This child was heavily infected on admission. Septicaemia, ileus, and an anoxic episode were all factors that could have contributed to a fatal outcome.

Case 5

An infant aged 6 days had a tracheotomy under general anaesthesia and started I.P.P.R. soon after admission on December 12, 1957, with tetanus. Mephenesin, 2 gr. (130 mg.) hourly, was required to control spasms. The child never recovered consciousness. The pupils were first contracted and then dilated and fixed. There was a dusky cyanosis. The radial pulse was not palpable. Cortisone, digoxin, and methylamphetamine hydrochloride ("methedrine") were given. On the third day for a short period the pulse became palpable and urine was passed for the first and only time. The next day the child died. No stools were passed during the illness.

At post-mortem examination nothing abnormal was found. The cause of death appeared to be circulatory failure.

Case 6

This child was 8 days old when admitted to hospital on February 5, 1958, with tetanus, and had a tracheotomy under general anaesthesia. On her return from the theatre the pulse rate was over 200. I.P.P.R. was started. Mephenesin, 100 mg. two-hourly, and phenobarbitone, ¼ gr. (16 mg.) t.d.s., were given by stomach tube. Spasms were not adequately controlled. The infant remained slightly cyanosed, with contracted fixed pupils. On February 6 the mephenesin was increased to 100 mg. hourly. Although spasms were now controlled there was no improvement in the heart rate, which remained over 200. The pulse became weaker, and the heart sounds softer. As no urine had been passed the infant was catheterized and 25 ml. of urine obtained. At 4 p.m. on February 7 all therapy except I.P.P.R. was stopped. An E.C.G. taken at this time is shown in Fig. 3. The infant remained flaccid and unresponsive until death occurred at 11 p.m. on February 8. No stools were passed during the illness. A blood culture taken soon after death was sterile.

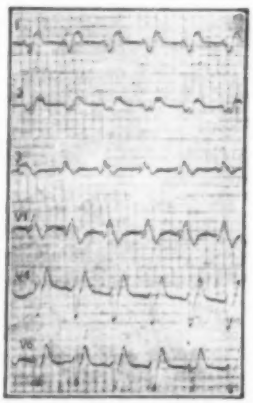

FIG. 3.—Case 6. The electrocardiogram shows auricular standstill. The ventricular rate is 70 a minute, with marked widening of the QRS, producing a gross right bundle-branch block patern. The record is in keeping with severe hyperkalaemia. It also occurs preterminally before the onset of ventricular fibrillation.

At post-mortem examination there was congestion of the lungs; otherwise nothing abnormal was found. The cause of death appeared to be circulatory failure.

Case 7

An infant aged 6 days was admitted to hospital on March 16, 1958, with tetanus. Tracheotomy was performed under general anaesthesia. Spasms were partly controlled with phenobarbitone, ¼ gr. (16 mg.) t.d.s., and mephenesin 1 gr. (65 mg.) hourly by stomach tube. This child was given a trial with tracheotomy alone, but gradually deteriorated with increasingly shallow respirations and cyanosis so that I.P.P.R. had to be started on March 18. Despite some initial improvement the child died on March 23. An immediate post-mortem blood culture grew *Escherichia coli*.

At post-mortem examination the cause of death was found to be a severe bronchopneumonia.

Comment.—In this infant there was difficulty with a collapsed lung and superimposed infection occurred.

Case 8

A female infant aged 7 days was admitted to hospital on April 22, 1958, with tetanus. There was considerable infection of the umbilicus with a surrounding zone of erythema about 2 in. (5 cm.) in diameter. Tracheotomy and I.P.P.R. were carried out soon after admission. Gammaglobulin, 2 ml., was given intramuscularly as well as penicillin, streptomycin, and A.T.S. Whenever spasms occurred, which was about every 12 hours, 10 mg. of tubocurarine chloride with 0.5 ml. of hyalase was given intramuscularly. This was found more effective than any previous method, and produced complete relaxation. During the first few days the pulse volume was good and urine was passed; but slow deterioration followed. By the 9th day the infant appeared slightly cyanosed and comatose; the left upper lobe of the lung had collapsed and the radial pulse was barely palpable. Her condition appeared critical. Quite unexpectedly on the 10th day of I.P.P.R., no spasms having occurred for 17 hours after the last injection of curare, she opened her eyes. Within 24 hours she was weaned off I.P.P.R. and passed her first stool since admission. Spasms were now controlled with mephenesin, chloral, and phenobarbitone.

Water was swallowed from a Bellcroy feeder on the 26th day. Milk feeds were not taken from a bottle until the 31st day. All sedation was stopped on the 39th day, although muscular tone was still considerably increased. Repeated attempts were made to remove the tracheotomy tube, but these invariably resulted in such marked costal recession and cyanosis that the tube had to be reinserted. On the 56th day a Parker tracheotomy tube was inserted in which a hole had been made to communicate with the larynx. Occlusion of the ostium of the tube was sometimes followed by a period of adequate breathing, but ultimately always resulted in a severe cyanotic attack.

The following day breathing sounded obstructed and the tube had to be forcefully removed. The cause of the obstruction was a piece of granulation tissue (confirmed by histology) about 1 by 0.5 cm. which had herniated through the hole in the tube and had been guillotined off as it was removed. It was not clear whether this was another granulomatous polyp, as was found in Case 3, or simply granulation tissue off the wall of the tracheotomy opening. A fairly small area of attachment favoured the former explanation. Hopes were entertained of being able to remove the tube, particularly as the tone of the muscles was now normal, but further attempts were equally ineffective. On the 60th day, laryngoscopy under general anaesthesia failed to reveal any obstruction. On the 67th day after admission the tube was successfully removed, and the infant was subsequently discharged home apparently quite normal.

Comment.—This appears to be the first recorded case of tetanus neonatorum successfully treated with I.P.P.R. It seems to have been a severe case because of the intensity of the early spasms, the length of apparent coma, and the subsequent duration of muscular hypertonicity. In muscular curare was used because of the difficulty previously experienced in the severer cases of obtaining satisfactory control of spasms with mephenesin.

Case 9

A male infant aged 11 days was admitted to hospital on July 11, 1958, with a one-day history of tetanus. Tracheotomy was done under general anaesthesia and

spasms were fairly well controlled with phenobarbitone, ¼ gr. (16 mg.) t.d.s., and chloral, 1 gr. (65 mg.) two-hourly. Twenty-four hours later an episode of apnoea with cyanosis occurred, so I.P.P.R. was started. Mephenesin, 1 gr. (65 mg.) hourly, was given by stomach tube and the chloral was stopped. The pulse volume was satisfactory and urine and stools were passed normally. By the sixth day spontaneous breathing out of phase with the pump had started, but I.P.P.R. was continued for another day as the infant seemed quite comfortable. On the seventh day I.P.P.R. was stopped. The mephenesin dosage was reduced to 65 mg. two-hourly and chloral, 1 gr. (65 mg.) two-hourly was recommenced. Except during spasms this infant always swallowed his saliva quite well. Sucking movements were made on the 14th day. Water was taken from a Bellcroy feeder on the 15th day, but swallowing was not quite satisfactory as some water leaked out of the corner of the mouth until the 22nd day, after which all feeds were taken by bottle. Hypertonicity of muscles diminished and by the 29th day, when the tracheotomy tube was removed, he was partially unclasping his fingers and moving his arms around freely. He appeared quite normal when discharged home two days later.

Comment.—This case, of moderate severity, ran a fairly uneventful course.

General Management

On admission 1–2 ml. of intramuscular paraldehyde was given to control spasms. 10,000 units of A.T.S. intravenously and 20,000 units intramuscularly were given. 2 mg. of vitamin K was given to minimize bleeding at tracheotomy.

Tracheotomy was done under ether-and-oxygen general anaesthesia, with an endotracheal tube passed. No cuffed treacheotomy tube was available for infants, so a tube was made from a piece of Magill No. 1 endotracheal "portex" tubing 1¼ in. (28.6 mm.) long. This tube was passed through a window cut in the trachea and, without any cuff, fitted snugly enough to maintain positive pressure and prevent much leakage of saliva down from the pharynx. It was secured only by tape around the neck. The chest had to be auscultated frequently to ensure that the air passages were clear and that the tube was well placed, as small changes in the angle or depth could improve or impair air entry to the lungs. A brass connecting-piece inserted at one end attached the tube to the Radcliffe pump via the delivery arm. This arm was kept at an angle, with the Stott valve at the lowest point to ensure that water of condensation did not run into the infant. Dressing was not applied to the tracheotomy wound, with the result that there was far less subsequent trouble from infection.

With the exception of Cases 2, 5, and 9, which were given a trial period of tracheotomy and sedation alone, I.P.P.R. was started as soon as the infants returned from the operating theatre. The respirator was run at 26 cycles a minute and the pressure at 10–12 cm. of water. In Case 7 this was reduced to 8–9 cm.

The duration of I.P.P.R. in the four patients who achieved spontaneous respiration was largely determined by trial and error. The three infants on mephenesin were not completely paralysed, and spontaneous respirations out of phase with the pump indicated the time for a trial of unassisted breathing. In the child treated with curare (Case 8) attempts were made to lengthen the interval of about 12 hours between injections. Although spontaneous respirations occurred, and at times continued without the pump, muscular twitchings and spasms would necessitate more curare. Quite abruptly this interval became prolonged and spontaneous breathing without the pump appeared to be adequate. Weaning from the pump was achieved over 24 hours by increasing the duration of spells of unassisted respiration. If there was a rising pulse rate, shallow breathing, or slight cyanosis a further period of assisted respiration would be given, and it was noticeable that the pump would take over respiration if it was required. If the pump was applied when it was not necessary the infant seemed to be uncomfortable and salivated excessively.

Once normal respiration was firmly established the plastic tracheotomy tube was changed for a No. 16 metal Parker tracheotomy tube. This tube was changed every four days. The infant was now nursed in a plastic oxygen box into which fresh humidified air was pumped by the Radcliffe respirator. This maintained humidity high enough to prevent trouble with concretions in the tracheotomy tube. With the shorter and narrower Parker tracheotomy tube the need for a cuff appeared to be greater, as a lot of saliva was aspirated at times from the trachea. Removal of the tracheotomy tube was not attempted until all saliva and feeds were swallowed normally and there were no attacks of laryngospasm. It is not clear why there was such difficulty in the final removal of the tube in Case 8. Possibly granulation tissue growing into the lumen of the trachea was the cause, and that may be an important complication of prolonged tracheotomy at the age of this infant. If hypertonia of the laryngeal muscles persists as long as it does in the limb muscles (in Case 8 for eight weeks) it may cause some degree of laryngeal obstruction, such as occurs in spastic infants. It is always possible that a bolder policy might have got the tube out earlier.

Relaxation with mephenesin in doses of ½–2 gr. (33–130 mg.) an hour, given by stomach tube, had the advantage of ease of administration and of relaxation without total paralysis, so that in the event of a mechanical failure of the respirator spontaneous respiration might still be possible. The control of spasms was, however, less certain than with the tubocurarine chloride given with hyalase intramuscularly. For a neonate the dose of 10mg. of soluble curare is many times larger than that usually given in anaesthesia to produce muscle paralysis. It produced adequate relaxation in Case 8 for approximately 12 hours, and, so far as could be judged by clinical observation, there were no effects other than myoneural paralysis. Nor did the rapid rate of recovery of adequate respiration and muscle tone, following injections twice daily for 10 days, suggest that there was any cumulative effect. After stopping I.P.P.R., spasms were still moderately severe but rarely so prolonged as to cause cyanosis. They were adequately controlled with chloral, 1 gr. (65 mg.) and mephenesin, ½–1 gr. (33–65 mg), two-hourly, and phenobarbitone ¼ gr. (16 mg.) t.d.s. given by stomach tube. As the spasms decreased these drugs were reduced, being finally discontinued four to five weeks after admission.

Every effort was made to prevent pulmonary infection. A tube was run from the air inlet port of the Radcliffe pump out of the window, so that only fresh air was inspired by the infants both while on positive-pressure respiration and while in the oxygen box. Nurses and doctors wore masks, and hands had to be washed before aspirating the tracheotomy tube. "Polythene" tubes of

1 mm. diameter were used for suctioning the trachea and were kept in benzalkonium chloride. After the Parker tracheotomy tube was inserted, a size 3 rubber catheter was also used for suctioning, and was boiled before being used again. Rubber catheters were used for suctioning saliva from the mouth. 100,000 units of procaine penicillin was given intramuscularly daily to control infection; also, in the later cases, 125 mg. of streptomycin intramuscularly twice a day. Chloramphenicol was given in some cases.

Whether to use prophylactic antibiotics in an infant of this age with a tracheotomy is a difficult problem, but in Cases 8 and 9 all antibiotics were stopped after 14 days, with no trouble from infection, whereas in Case 3 continuous antibiotic cover resulted in a suppurative tracheitis due to a resistant staphylococcus. A good aseptic technique and efficient aspirations of the trachea and large bronchi are the more important factors in preventing infection. In Cases 8 and 9, to assist in the control of infection, 2 ml. of gamma-globulin was given intramuscularly on admission, this being repeated in Case 8 after six weeks. This procedure will be given a further trial in any future cases. Hydrogen peroxide compresses only were applied to the umbilicus.

Pressure sores on the scalp and actual depression of the bones of the skull developed in Case 1. Subsequently these were avoided by nursing the infants supine with the head lying free over the edge of a pile of blankets, most of the weight being taken by the nape of the neck supported on a roll of gamgee. This posture allowed full expansion of the chest, and, even though the infants were not turned at all for periods of up to 10 days because of the difficulty of maintaining a stable posture when lying on the side, no pressure sores developed, nor were there any hypostatic pulmonary complications.

A stomach tube was passed through the nose, preferably while the infant was still under the general anaesthetic. It may be difficulty or impossible to pass a tube in the presence of tetanic spasms, possibly because of spasm of the soft palate or pharynx. If the tube had to be changed after relaxants had been discontinued, 1 ml. of paraldehyde was given intramuscularly to obtain adequate relaxation. Glucose water only was given by tube for the first few feeds and the stomach was aspirated four-hourly to ensure that there was no residue. Subsequently milk feeds were given, but aspiration of the stomach four-hourly was continued because of the frequency of ileus, with the risk of vomiting. Feeding by mouth, with water from a Bellcroy feeder, was attempted only after trismus had diminished enough for the infant to make sucking movements and pharyngospasm had been relieved enough for saliva to be swallowed. About five days' practice with a Bellcroy feeder was necessary before milk was taken normally from a bottle.

Hypothermia developed insidiously and rapidly. Four-hourly temperatures were taken with a low-reading thermometer and the child was warmed whenever necessary. Unlike older children with tetanus, these infants did not develop hyperpyrexia.

No praise can be too high for the nursing staff, who were all student nurses and without any special training. It is clearly desirable that changes of staff should be as infrequent as possible, so that the nurses may have the opportunity of familiarizing themselves with the technique of tracheal suction and with the appearance of the patient, and, by recognizing minor changes, undertake corrective measures before serious retrogression has time to occur.

Discussion

There may be some doubt about the accuracy of a diagnosis of tetanus in the first few days of life, particularly as swabs from the umbilicus were cultured in all of the present series of cases, both on admission and at necropsy, without revealing tetanus bacilli. Excision of the umbilicus was not considered justifiable either as a therapeutic or as a diagnostic measure. It is felt, however, that the clinical picture even at this age is sufficiently characteristic. The early appearance of trismus in an infant that has thrived for the first few days of life, refusal to suck, followed by a risus sardonicus with pursing of the lips and frequently expression of saliva, together with generalized opisthotonic spasms provoked by stimuli, and board-like rigidity of the abdominal muscles, are as diagnostic in the infant as they are in the adult.

Although only two children recovered out of nine in this series, two deaths—one from cerebral anoxia and one from the tracheotomy—occurred after the infants had recovered from the effects of tetanus. At least one, possibly two, other infants died with a septicaemia, indicating the added hazard of umbilical sepsis and infection. Furthermore, the length of survival appeared to be prolonged, as all cases survived more than two days (see Table). This is in contrast to the average survival of 2.2 days among the 39 dying previously at this hospital from tetanus neonatorum following treatment with various combinations of different sedatives, chlorpromazine, cortisone, and hypothermia, but not with tracheotomy; two infants survived seven days, no others survived longer than four days. No fewer than 16 of the infants died within 24 hours of admission. It would appear, therefore, that tracheotomy with I.P.P.R. is an improvement on previous methods of treatment of tetanus neonatorum; and it is clear that this procedure is practicable even in these small infants.

Summary of Results of Treatment of Tetanus Neonatorum With I.P.P.R.

Case	Age on Admission (Days)	Days of I.P.P.R.	Days of Survival	Relaxant and Sedative	Cause of Death
1	4	15	49	Paraldehyde, phenobarbitone	Cerebral atrophy due to anoxia
2	6	1	2	" "	Circulatory failure anoxia
3	8	5	48	Mephenesin phenobarbitone	Granulomatous polyp in trachea and staphylococcal tracheitis
4	4	7	7	" "	Septicaemia, circulatory failure, anoxia
5	6	4	4	Mephenesin	Circulatory failure
6	8	3	3	Mephenesin, phenobarbitone	" "
7	6	5	7	" "	Bronchopneumonia
8	7	10	Recovered	Intramuscular curare with hyalase, followed by mephenesin, phenobarbitone, chloral	
9	11	7	"	Mephenesin, phenobarbitone, chloral	

Tompkins (1958) has described some of the factors that influence the severity of tetanus in the neonate. Two other factors were found useful in this series. They were brain-stem involvement with signs of respiratory or

circulatory failure, ileus, and coma, which always indicated a severe form of the disease; and the severity and duration of muscular spasm, especially of the pharynx. In milder forms the infants may swallow all saliva and even their feeds; with increasing severity of the condition saliva was extruded from the mouth, but only during spasms, and choking was likely to occur if feeds were given. In the most severe form no swallowing was possible at all, and saliva drooled continuously out of the mouth or lay pooled in the pharynx. During recovery the sequence was reversed and the number of days of treatment before, firstly, all saliva was swallowed and, finally, all feeds were taken normally from a bottle, was greater in those with a more severe form of the disease.

Even in the less severe forms the mortality remains high when sedation is the only treatment (Tompkins, 1958). It might be anticipated that tracheotomy would improve the prognosis, as anoxia due to laryngospasm or pharyngospasm, with retention of saliva in the pharynx, is common in these infants. In some cases tracheotomy may suffice, and no assisted respiration will be required; but respiratory failure should be watched for, as it can develop insidiously and quickly. In two of these infants shallow breathing and diminished spasms were misinterpreted as indicating good control, whereas they heralded apnoea and cyanosis. Because of this, early trial of I.P.P.R. may be preferable, and it would reduce the chances of any anoxia developing. I.P.P.R. can always be stopped as soon as spontaneous breathing appears adequate or if no improvement results. In the milder cases mephenesin may be the drug of choice as it allows of spontaneous respiration, but the more severe cases, with spasms that are difficult to control, cyanosis, and circulatory collapse, would appear to be better treated with curare.

Many problems require further investigation: in particular, the circulatory failure which dominated the clinical picture in those infants who died of tetanus. This was characterized by tachycardia, a fall in blood pressure (roughly estimated by the impalpability of the radial pulse, then the brachial, and finally the femoral), a dusky cyanosis, coma, and anuria. The abnormal E.C.G.s (see Figs. 2 and 3) taken in the late stages may well have been due to hyperkalaemia associated with anuria which followed upon the circulatory failure. There are many possible causes of the circulatory collapse. Tetanus toxin may have a direct toxic effect on the myocardium, although Brönnimann and Stirnemann (1956) were unable to demonstrate experimentally any such effect in the early stages of the disease. A more likely explanation would be tetanus intoxication of the brain stem causing circulatory collapse, with cardiac anoxia as a secondary effect. Another factor may have been cerebral anoxia due to incorrect ventilation by the pump.

The inspiratory pressure at which to run the pump was judged solely by auscultation of the chest and the clinical picture of the infant. Quite possibly this was too high and may have impeded the circulation by compressing the pulmonary capillaries. Such an effect would be accentuated by the incomplete muscular relaxation obtained by mephenesin, as the lungs would have to be expanded against muscle tone. Curare, by producing total relaxation of muscle, may allow a freer expansion of the lung and a better pulmonary circulation.

Other aspects requiring clarification are the disturbance of bowel function; which varied in severity from prolonged constipation to ileus; the generalized oedema, which was marked and prolonged; and the disturbance of consciousness. Although the level of consciousness was difficult to assess while relaxants were used, there did appear to be a definite moment when the return to consciousness could be ascertained. Furthermore, it may be significant that this always occurred before it was possible to stop I.P.P.R.

One other sign was a source of conjecture. This was the muscular flaccidity that occurred in the terminal phases of some cases. It may well have been due to anoxia (van Liere, 1942); but it is of interest that Brönnimann and Stirnemann (1956) have produced a flaccid palsy experimentally in animals by injecting more than twenty times the single lethal dose of tetanus toxin. This paralysis was fatal if artificial respiration was not provided. If a high concentration of toxin can cause paralysis, it could explain the palsy seen in cephalic tetanus, the flaccid terminal state of severe tetanus often ascribed to exhaustion. It could also explain the fact that in some cases in this series muscular tone appeared to increase for a time during the period of recovery, though previously it had been depressed. The importance of such a concept is that I.P.P.R. may be essential in the treatment of severe cases of tetanus if this type of paralysis occurs.

In future more active steps will be taken to overcome the circulatory failure; and, by estimating oxygen and carbon-dioxide levels in the arterial blood or alveolar air, to try to determine the optimum rate and pressure for the respirator. If, however, the clinical picture of circulatory failure with coma and ileus is largely due to tetanus intoxication of the brain stem, the prognosis is likely to remain gloomy. Should the superimposed effects of anoxia, hypercapnia, and drug therapy determine the outcome, much would still remain to be achieved.

Summary

A modification of the Radcliffe intermittent positive-pressure respirator is described which allows prolonged assisted respiration to be applied to neonates.

Nine cases of tetanus neonatorum which were treated with I.P.P.R. are described. Two children recovered completely. Two others survived for seven weeks and died from causes other than tetanus.

The methods employed to overcome difficulties that arose during treatment are outlined and the problems that still require clarification are discussed.

ADDENDUM.—Since this article was written the following case has been under our care.

Case 10

An infant aged 14 days was admitted to hospital and ran a similar course to that of Case 9. Respiration was assisted with I.P.P.R. for four days. Progress was uninterrupted except that, despite numerous attempts, the tracheotomy tube could not be removed. When the infant was 12 weeks old a bronchoscopy was done and granulomatous tissue was found obstructing the airway. It was extracted with forceps via the tracheotomy stoma. Two days later the tracheotomy tube was successfully removed. This clearly shows, what previously had only been suspected, that with prolonged tracheotomy in neonates granulation tissue may form around the tube in such quantity as to obstruct the airway.

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TREATMENT OF SEVERE TETANUS

BY

J. R. LAWRENCE, M.B., B.S., M.R.A.C.P.
Barker Research Fellow, Department of Medicine, University of Adelaide

AND

M. J. W. SANDO, F.F.A.R.A.C.S.
Senior Registrar, Anaesthetic Department, Royal Adelaide Hospital

Tetanus, a largely preventable disease, remains one of the few bacterial infections for which curative therapy is not available and the precise pathology of which is still disputed (Payling Wright, 1956; Abel *et al.*, 1938; Brooks *et al.*, 1955). However, it has been claimed, with considerable justification, that in most cases tetanus is a self-limited disease provided the patient can be tided over the storms of its assault. In some cases the mode of death is obscure, but many patients die from pulmonary causes, either from asphyxia during spasm involving the larynx and respiratory muscles, or from aspiration pneumonia and atelectasis (Creech *et al.*, 1950; Adriani and Kerr, 1955; Garcia-Palmieri and Ramirez, 1957).

The main aim of treatment, therefore, is to support the patient through the acute attack by minimizing muscular spasm and rigidity and by preventing respiratory infection. This involves a carefully integrated plan of management in which sedation and, more recently, muscle relaxants are used.

Many excellent articles have appeared in recent years, reviewing the conflicting views on the pathogenesis and treatment of tetanus (Drew, 1954; Shackleton, 1954; Forbes and Auld, 1955; Ablett, 1956; Creech *et al.*, 1957). Except for the reports of Adriani and Kerr (1955) and of Veronesi (1956), most of the larger series of cases have come from centres with relatively limited resources (Johnstone, 1958), while the application of newer techniques has been reported in smaller numbers, making assessment of their value difficult. Further difficulty in comparing the results of treatment arises because so many factors affect the outcome of tetanus and cases must be divided into prognostic categories, often by elaborate criteria.

The value of tracheostomy is generally accepted, and more recent methods of treatment which have been advocated include continuous or intermittent intravenous mephenesin (Adriani and Kerr, 1955; Veronesi, 1956), or chlorpromazine, promethazine, and pethidine, which has been used extensively in Europe, and full curarization with artificial respiration (van Bergen and Buckley, 1952; Lassen *et al.*, 1954). Other clinics have further complicated the management by using hypothermia (Hossli, 1956).

In a period of five months from June to October, 1957, 14 cases of tetanus were admitted to the Royal Adelaide Hospital, and nine of these were classified as severe. They were treated by full curarization and artificial respiration. These nine cases are reported here with a description of the problems which arose in the use of this technique, and an assessment of its value in the severe case.

Method of Treatment

Each patient was admitted to a sound-proof room, and after skin tests 300,000 units of antitetanic serum was administered, half of it intravenously. Surgical opinion was then obtained on the question of debridement of the entry wound. When it was indicated, tracheostomy was performed under general anaesthesia at the same time as debridement, and a cuffed rubber tube was inserted. The indications for tracheostomy were essentially those of Ablett (1956), and this operation was performed early rather than late. Assessment of the patient's ability to cough effectively was found to be particularly significant. In order to correct the frequent dehydration, to nourish the patient, and to administer drugs, an intravenous drip was inserted, preferably a "polythene" catheter to prevent extrusion during spasms. By this route, in the earlier cases, mephenesin and later chlorpromazine were administered intermittently. Penicillin was given, and the sedatives found to be useful were promethazine, pethidine, chlorpromazine, paraldehyde, and chloral. If tracheostomy had to be performed, sterile tracheal toilets were done. During this time there was continuous nursing surveillance with frequent medical assessment.

If heavy sedation failed to inhibit spasms, especially of the muscles of respiration, curarization was begun with artificial respiration. This involved continuous medical supervision together with expert anaesthetic assistance, particularly during the periods of induction and of decurarization.

The gases were delivered to the patient through the absorber unit of an anaesthetic machine, maintaining a flow of 6 to 8 litres a minute. During the period of initiation and stabilization a mixture of nitrous oxide and oxygen was used and then a variable mixture of compressed air and oxygen, breathing being maintained by the Beaver respirator adjusted to provide positive and negative pressure. Ventilation was mainly controlled according to half-hourly records of blood pressure, pulse rate, the presence or absence of sweating, and cyanosis. These observations were affected by variations in posture, sedation, muscular tone, and infection, as well as by hypoxia and carbon dioxide retention or lack. Twice-daily estimations of venous carbon dioxide combining power gave warning of gross respiratory alkalosis. The *p*H of the blood and plasma was also measured. The latter was found to be more

variable and more sensitive to acute changes in ventilation than the carbon dioxide combining power. Both investigations were repeated when the patient's condition required urgent assessment.

Curarization was instituted by the intravenous route, but maintenance could be effectively achieved by intramuscular injections of between 60 and 90 mg. of D-tubocurarine. The indications for further doses were a rising blood pressure or pulse rate, the appearance of muscular twitches, movement of the tongue, face, or lips, or breathing motions.

Sedation, while the patient was curarized, was intended to produce amnesia and, to some extent, analgesia. It was not necessary to maintain anaesthesia, but in the absence of movement it was sometimes difficult to assess how much sedative to give. Changes in pulse rate and blood pressure were produced by many factors other than the level of sedation, and a method of resolving such doubts was devised by giving nitrous oxide. If administration of this gas reduced the pulse rate and blood pressure to basal levels it was felt that the previous sedation had been inadequate. Several patients had vague memories of events during their period of paralysis, but said that these were not distressing. The sedatives used during curarization were promethazine and pethidine, given alternately.

One of the objects of this method was to keep the respiratory tract free of infection. The cuffed tube prevented inhalation of pharyngeal contents but inevitably produced superficial ulceration of the tracheal mucosa, which, however, healed when the tube was withdrawn. To minimize this effect, the cuffed tube was released for five minutes every two hours after pharyngeal toilet had been done with the patient in the head-down position. Lung complications were prevented by frequent postural changes and the foot or head of the bed was raised, as indicated by the clinical detection of areas of collapse or persistent rhonchi. Secretions were removed by means of a sterile lubricated Tiemann catheter. This was aided by heavy percussion on the chest wall and by compression at the end of the expiratory phase. When the secretions were tenacious, "alevaire" was used and sodium bicarbonate was instilled into the tube two-hourly. With the above technique bronchoscopy was not necessary, and quite dense opacities were cleared (see Fig. 1). The chest was radiographed daily, the lungs being held inflated.

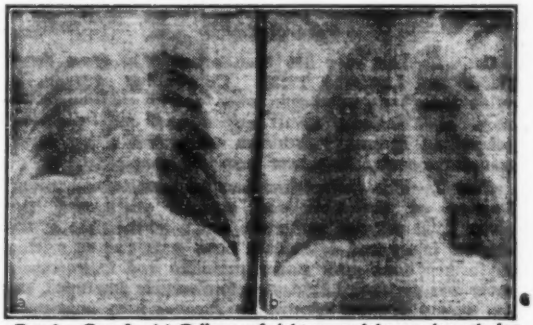

FIG. 1.—Case 2. (*a*) Collapse of right upper lobe on eleventh day of illness. (*b*) Fifty-five minutes later, after percussion and aspiration.

Tracheal secretion was cultured daily, prophylactic antibiotics being changed according to the sensitivity of pathogenic bacteria found. Masks were worn by all those attending the patient.

The ideal time for decurarization was when the patient could tolerate tracheal suction and could cough without developing generalized spasm. It was determined by trial. The period required varied from 18 to 72 hours, a careful watch being maintained for evidence of persistent severe tetanic activity. Some patients became restless, tending to breathe against the machine, and we found that the ideal sedative then was nitrous oxide given for short periods, together with manual control of respiration.

During the period of curarization the patient was nourished through an intragastric polythene tube, and, although gastric contents sometimes regurgitated through the relaxed cardia, tracheal aspiration was

Details of Cases

Case	Age and Sex	Incubation Period (Days)	Time of Onset (Hours)	Focus of Infection: Site	Focus of Infection: Treatment	Tracheostomy (Hours after Admission)	Curarization: Begun after Admission	Curarization: Total Period	Complications	Result
1	57 M	14	40	Tip of index finger	Amputation of distal phalanx	12	20 hours	15 days	Granulocytopenia	Cured
2	26 M	15	43	Infected ununited compound fracture of tibia and fibula; bone graft	Knee-level amputation	31	2 days	17 „	Surgical emphysema, mediastinitis, hyperglycaemia, lung abscess	
3	16 M	8	30	Nail in sole of foot	Excision of wound	20	2 „	16 „	—	
4	732 M	14	3	"40% full-thickness burns of legs and buttocks	Excision of sloughs	6 (after onset of disease)	3 hours (after onset)	4 „	Severe burns 14 days before tetanus occurred	Death: "Toxaemia from burns and tetanus"
5	34 F	14 15	36	Infected abortion	Hysterectomy	4	37 hours	3 „	Thrombophlebitis right leg	Death: "Massive pulmonary embolus"
6	5 M	5	20	Splinter in thigh	Excision of wound	20	22 „	10 „	Hypernatraemic uraemia. Hyperglycaemia	Cured
7	32 M		760		—	8	24 „	9 „	Anuria. Acute tubular necrosis	Death: "Uraemia (generalized haemorrhagic tendency)
8	10 M		30		—	9	24	12 „	Congenital "cerebral palsy," Granulocytopenia	Cured
9	47 M	5	36	Splinter in paronychia of finger	Amputation of distal phalanx	8	72	10 „	Chronic bronchitis. Bilateral basal pneumonia. *Ps. pyocyanea* septicaemia	Death. "Multiple pulmonary emboli"

prevented by the cuffed tube. Voiding occurred spontaneously or urine could be expressed manually and collected by continuous "sheath" drainage. Physiotherapy was given twice daily and frequent skin toilets were performed. Brief details of the cases are summarized in the Table.

Clinical Details

Case 1.—This case has been reported in more detail (Sando and Lawrence, 1958). Curarization with nitrous oxide anaesthesia was begun when, despite sedation to the stage of "periodic breathing," stimuli still produced generalized spasms. Although there was a period of granulocytopenia, the patient recovered completely.

Case 2.—This patient had had an ununited compound fracture of the tibia for over 2 years and was given 1,500 units of antitetanic serum at the time of the original injury and again at a bone graft one year later. A further bone graft under penicillin and streptomycin cover was performed 15 days before tetanus developed, but the wound became infected by *Pseudomonas pyocyanea*. The case apparently had a long incubation period and at first did not seem to be particularly severe. In fact, the tetanic process was prolonged and severe. The wound debridement was inadequate, and tracheostomy, which was done under local anaesthesia, was left too late, so that pneumonia was already present. Fifteen days after curarization had begun a staphylococcal abscess formed at the right lung base followed by a total empyema with massive collapse of the lung. After a prolonged convalescence the patient had his amputation stump refashioned and his empyema decorticated. He remains well. Sugar and acetone were present in the urine on admission, and blood-sugar levels rose to 240 mg. per 100 ml. Levels of 120-130 mg. per 100 ml. were maintained with 25 units of soluble insulin every six hours. As soon as the tetanic process abated, however, despite the persistent lung infection, the blood-sugar level fell to the normal range and glucose-tolerance curves were consistently normal.

Case 3.—By the time this patient arrived the routine was better organized, and, despite the short incubation period, this patient had a less troublesome course and a rapid convalescence.

Case 4.—This patient developed tetanus while being treated for extensive deep burns and had been given 1,500 units of antitetanic serum when admitted to hospital 14 days previously. He had a particularly brief time of onset, but was apparently well controlled by curarization until he died suddenly, no cause of death being found at necropsy. In this patient, massive administration of antitetanic serum caused anaphylaxis with tight bronchospasm. Although suxamethonium chloride was given, the chest could not be inflated manually until adrenaline was administered intravenously. Had emergency measures, including an anaesthetist and equipment for endotracheal intubation not been immediately available, this patient would have died of anaphylatcic shock.

Case 5.—This patient had induced an abortion, using a syringe, five days before she was admitted to hospital. Hysterectomy and tracheostomy were completed five hours after she was admitted, and her early progress was satisfactory. In this case, as in Cases 3 and 7, curarization became necessary when tracheal aspiration began to produce apnoea and anoxic spasm despite sedation, intravenous mephenesin, and chlorpromazine. The patient died very suddenly, only four days after her operation, with a massive pulmonary embolus.

Case 6.—This boy, aged 5, was transferred from the Adelaide Children's Hospital. He had a short incubation period and time of onset. The sixth to the eighth day of his illness was stormy, with periods of tachycardia, cyanosis, and hyperpyrexia. There were anaesthetic ventilatory problems and he had a hypernatraemic hyperchloraemic uraemia probably associated with excessive protein intake. Having weathered this storm, he improved quite rapidly, but was left with a mild tracheal stridor from granulation tissue for some months after his tracheostomy had healed. Meteorism and retention of faeces due to D-tubocurarine caused abdominal distension, made ventilation difficult, and obstructed venous return. This was relieved by neostigmine without precipitating further spasms. During the period of neostigmine effect, suxamethonium chloride was substituted for tubarine.

Case 7.—It seemed that this patient would not have had particularly severe tetanus, but he had been having spasms at home for 48 hours before admission and could not swallow. He was severely dehydrated and was given intravenous fluid, chlorpromazine, and mephenesin while hydration was re-established. However, 12 hours after admission his blood urea nitrogen was 52 mg./100 ml. and the serum potassium 6 mEq/l. Anuria persisted despite strict fluid and protein restriction, and dialysis was not available. No blood pigments were seen spectroscopically in the small amount of urine passed, but necropsy showed renal tubular necrosis with many dark tubular casts.

Case 8.—This patient had congenital cerebral palsy with marked speech defect, involuntary movements, and spasticity. He was admitted to hospital after several typical tetanic spasms and became anoxic during a severe spasm in the casualty department. Chlorpromazine, 20 mg. intravenously, rapidly relieved the spasm and anoxia. Curarization was effective, but when this was discontinued after 12 days he became very restless, with generalized rigidity and choreathetotic movements, which it was felt were due to a combination of resolving tetanus and his congenital disability. The best sedative during this period of hyperkinesia was nitrous oxide, as tolerance developed to other drugs, and we were forced to administer this gas for considerable periods, particularly during the three days after discontinuing curare. It was used for short periods during the next three days, and a blood picture done at this stage showed a red-cell count of 3,200,000/c.mm.; haemoglobin, 9.2 g./100 ml.; platelets plentiful; leucocytes 2,300/c.mm (polymorphs 11%, lymphocytes 83%, monocytes 1%, eosinophils 5%). Nitrous oxide was discontinued, 3 pints (1.7 l.) of blood was transfused and, as in Case 1, there was a rapid and dramatic response over the succeeding seven days, the leucocyte count rising to 12,900/c.mm. (see Fig. 2). The patient had also been having a number of other drugs, including phenobarbitone, pethidine, promethazine, chlorpromazine, methenesin, and paraldehyde. Although they were discontinued when the granulocytopenia developed, most of these drugs were

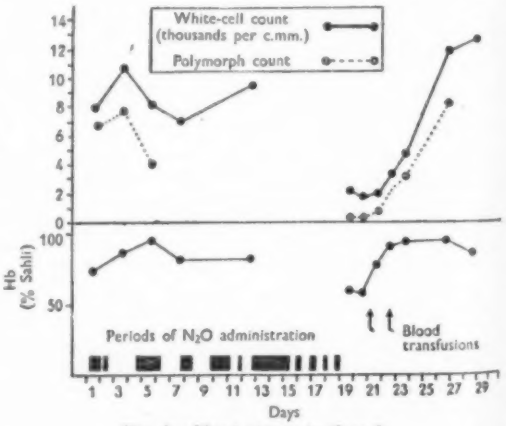

FIG. 2.—Blood picture in Case 8.

administered again later without any evidence of bone-marrow toxicity. After a period of pyrexia the restlessness and rigidity gradually subsided and the patient was cured of tetanus.

Case 9.—This man, who had recurrent bronchitis, had a short incubation period and time of onset. The white-cell count on admission was 32,000/c.mm., but his chest infection remained under control during the early management. However, three hours after beginning curarization he collapsed with hypotension and loud variable heart murmurs. He required noradrenaline for 20 hours; the blood pressure then recovered and his condition seemed satisfactory, although the leucocytosis persisted. Repeated blood cultures were negative, but *Ps. pyocyanea* was recovered from the heart blood at necropsy. A second transient episode of collapse occurred on the seventh day. Hyperglycaemia was also present during the first 10 days. On the tenth day D-tubocurarine was discontinued, tetanic activity by then having subsided. A thrombosis of the right femoral vein then became apparent, and, despite anticoagulant therapy, the left leg also became involved, congestive cardiac failure occurred, and after a further episode of collapse and anoxia he lapsed into a state resembling "coma vigil." He steadily deteriorated, and died 22 days after admission. Necropsy showed multiple pulmonary emboli of varying ages, and it would appear that the episodes of collapse described above were the result of recurrent incidents. There was no conclusive evidence of septicaemia and the heart valves were intact.

Discussion

The above group is too small to allow of definite conclusions, and the mortality (44%) was of the same order as that in many reported series of cases of severe tetanus. However, two of the four fatal cases had severe complications unrelated to the technique. Case 4 had extensive deep burns, while in Case 7 death occurred from renal failure. The former may have been an example of the fulminating case in which therapy proves useless because of the toxic effects on the brain-stem nuclei (Baker, 1942; Cole, 1953; Woolmer, 1954).

Two patients (Cases 5 and 9) died of pulmonary embolism, the former three days after beginning curarization, while the latter probably had his first embolus only three hours after D-tubocurarine was given. Another case of tetanus, in a man aged 75, was treated at this time. Curarization was not required, but he died some days after the tetanic process had abated. Necropsy showed several pulmonary infarcts and a terminal pulmonary embolus. Previous authors have not reported pulmonary embolism in cases of tetanus, but Hossli (1956) describes two cases with severe tetanus successfully treated by curarization and hypothermia. Both developed extensive thrombophlebitis, one of them having a thrombosis of the inferior vena cava. The flaccid paralysis induced by D-tubocurarine could contribute to the occurrence of venous thrombosis, which may be a complication of this method of treatment. However, this seems unlikely to have caused the first episode of presumed pulmonary embolism in Case 9, while both the infected abortion and the subsequent hysterectomy may have precipitated peripheral thrombosis in Case 5.

As may be seen from the Table, all of the surviving cases could be classed as severe, especially Cases 3, 6, and 8 which, it is suggested, fall into the group mentioned by Cole (1953) in which the use of relaxants saved life.

Lassen *et al.* (1954) reported that prolonged nitrous oxide anaesthesia may produce depression of bone marrow. The events in Case 1, as previously reported (Sando and Lawrence, 1958), appear to support this theory. For this reason, in succeeding cases nitrous oxide was used only for short periods during the induction of curarization, and to reduce restlessness during the period of decurarization, a function which it subserves very well. As described above, granulocytopenia and anaemia were observed also in Case 8, and although the situation was confused by the administration of other drugs the prompt response to the cessation of nitrous oxide provides further support for Lassen's suggestion. It is also significant that in both cases the depression was rapidly reversible. Thus, although nitrous oxide has a place in management, it should be used with care, and any prolonged use of the gas would require a careful watch on the blood picture.

A further interesting observation was hyperglycaemia, which was severe enough in Cases 2, 6, and 9 to warrant the use of insulin. The glycosuria experienced by these patients was often associated with ketosis and abated with decreasing tetanic activity. A review of the records of the last 44 cases of tetanus admitted to this hospital showed that in 11 cases a positive Benedict test of the urine was recorded. (Five of these patients had been given paraldehyde.) Jacono *et al.* (1953) showed decreased glucose tolerance in 14 cases of tetanus, of which only one had glycosuria. They suggested adrenal cortical stimulation as a cause. No ready explanation of this phenomenon is available, but damage to cells at the base of the brain or brain stem might be suggested.

In the cases reported from Nigeria by Glossop and Low (1957), paralysis and intermittent positive-pressure respiration were instituted when the patients were in advanced or fulminating stages of the disease, and most of them were azotaemic. High blood-urea levels were present in Cases 1, 4, 6, 7, and 9 of our group, but returned to normal in each patient who survived. The provocation of hypernatraemic hyperchloraemic uraemia in Case 6 by high-calorie high-protein feeding again emphasizes the need stressed by Wilson and Care (1955) for careful supervision of metabolic and electrolyte therapy in paralysed patients.

As numerous writers have pointed out, the time-honoured treatment of tetanus by massive sedation further depresses both the respiratory centres and cough, one of the most important defences of the lungs, thus increasing the likelihood of pulmonary complications in a chest already rigid from the effects of the tetanus toxin. We have been impressed in severe cases by the occurrence of apnoea in response to stimuli even after tracheostomy, heavy sedation, and mephenesin, and hence the need for a method which avoids such anoxic periods, eliminates the distressing spasms, and allows control of pulmonary secretions and infection.

In the fatal cases of this series, necropsy revealed the extent to which the lungs weer kept free from infection. There was superficial ulceration of the trachea and main bronchi, but there were no areas of consolidation or collapse in the lungs of Cases 4, 5, and 8. However, a purulent bronchopneumonia was present in Case 9, in which the patient died 10 days after curare was discontinued, and in Case 2, in which the patient survived and developed a pulmonary abscess. In both patients pulmonary infection was present before

eurarization began, and was apparently controlled during the period of D-tubocurarine administration.

Doubts have been expressed about the value of the more exacting and complicated techniques in treating severe cases of tetanus (Creech *et al.*, 1957), but we feel that, as Cole (1953) suggests, they will save a group of patients who previously would not have survived. The best results are obtained by experienced teams who have a planned routine, as Adriani and Kerr (1955) and Veronesi (1956) have shown, but their papers, despite convincing evidence of the value of intermittent relaxant drugs, reveal a group of cases that cannot be controlled adequately by their techniques. Thus, although Veronesi reports the excellent overall mortality rate of 18.9% in his last 236 cases, the death rate of the severe cases with a "time of onset" (Cole and Spooner, 1935) of less than 48 hours was still 44%. Chlorpromazine has been shown to be useful in the management of the disease, and its final place has yet to be assessed. Recent reports stress the use of very large doses (Hossli, 1956; Packard *et al.*, 1958). By measuring the degree of trismus we were able to show that chlorpromazine relaxes hypertonus in tetanus. It was particularly valuable when given intravenously as an "emergency" treatment of generalized tetanic spasm in Case 8. However, using relatively small intravenous doses, we found its action was short-lived, and Laurence *et al.* (1958) describe a case in which severe spasms could not be arrested by 50 mg. intravenously.

Thus there remains a group of patients in whom tracheostomy, paralysis, and artificial respiration would appear to be necessary. The use of this method has not so far been reported in a large series of cases, and the reduction in mortality in those which have been published is not impressive. This must partly be due to its use only in small numbers of severe cases, so that the staff treating the patients have not had an extensive experience of the many problems involved.

This technique eliminates the exhausting painful spasms and rigidity, making the patient more comfortable and less apprehensive. It allows nursing procedures and skin toilet to be done more effectively by eliminating the strain of working as silently as possible in a darkened room. The recurrent crises of apnoea and spasm which characterize other methods of management do not occur, and physiotherapy and adequate tracheal aspiration can be performed without precipitating further spasms.

Constant medical supervision, an essential part of this technique, is both an advantage and a disadvantage in a busy general hospital. Crises still occur, but they tend to be mechanical and reversible, involving the cuffed tracheostomy tube and respiratory or biochemical disturbances. (A large ancillary staff, including radiology, biochemistry, bacteriology, and haematology personnel, is also involved.)

Although this series is not large, we feel that the technique of paralysis and mechanical artificial respiration has a real place in the management of tetanus. It is indicated in the fulminating case or in the severe case when sedation and other relaxant agents fail to control reflex spasms and thoracic rigidity. Like tracheostomy, it should not be left until pulmonary infection is established or the patient is *in extremis*, but should be begun as soon as it is evident that simpler measures will not adequately control the tetanic process.

Summary

The treatment of nine cases of severe tetanus by paralysis with D-tubocurarine and artificial respiration is described. Four patients died, two of them from pulmonary emboli and another in acute renal failure. Several other complications occurred, including bone-marrow depression, thought to be related to prolonged nitrous oxide administration, and hyperglycaemia.

This technique relieves the distressing muscular hypertonus of tetanus and prevents spasms. It allows adequate pulmonary ventilation and aspiration to be performed, thus avoiding the respiratory complications which commonly result from the rigid thorax and inadequate cough of patients with severe tetanus. Feeding and nursing are made easier.

However, because of its complexity, the method should be reserved for fulminating cases or for those in which sedatives and other relaxant agents do not prevent reflex spasms. It requires careful continuous medical supervision and skilled anaesthetic control.

Tetanus in the more advanced communities should be treated by special units with adequate facilities, and paralysis with artificial respiration should be available for the severe case.

We thank Dr. C. B. Sangster and Dr. R. A. A. Pellew, under whose care these patients were admitted to hospital, and Dr. N. G. Marshall, the director of anaesthesia. We acknowledge the untiring efforts of the resident medical officers who were essential in this method of treatment, and the enthusiastic co-operation of Dr. W. Roman and his staff of the department of biochemistry. Professor H. N. Robson has materially assisted in the preparation of this paper, and we are grateful for his advice and help.

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Medical Memoranda

Addiction to Carbromal

Carbromal (α-bromo-α-ethylbutyrylcarbamide) is incorporated in a variety of proprietary preparations which are available freely without prescriptions to the general public as safe sedatives. The present case is reported in order to draw further attention to the possible serious consequences of overdosage and to the difficulties of dealing with addiction to it under the existing regulations.

CASE HISTORY

The patient, a married woman, was first admitted to hospital in June, 1949, when aged 54. Her husband and neighbours had observed that she had been taking about 30 tablets of "persomnia" (each containing carbromal 195 mg. and bromvaletone 65 mg.) daily for some months and had become lethargic, confused, and ataxic. Her doctor had already formed the opinion that she was a persomnia addict and had sought psychiatric advice, but no mental disease had been found.

On admission she was drowsy, but showed no localizing sign and no rash. Her recovery was uneventful except for the occurrence of a transient tremor of her hands. Samples of her urine and stomach contents taken on admission showed a considerable excess of bromine.

After discharge she continued to take persomnia in spite of her husband's efforts to prevent this, and was also known to take fairly large quantities of alcohol. Her mental condition showed progressive deterioration and she neglected her housework, which was done by her husband until he left her in the spring of 1958. Thereafter she was largely fed by her neighbours.

She was readmitted in June, 1958, having been found on the floor of the house with the room in disorder. Her doctor had removed several containers of persomnia tablets from her house some days previously. Clinical examination again gave negative findings, and she recovered within a few days. Psychiatric opinion remained that she had no mental disorder which justified restraint.

A very similar cycle of events recurred five time between July and September, although her doctor had contacted all local pharmacists and requested them not to supply her with persomnia. She consistently refused prolonged hospital or convalescent-home treatment, would not accept admission to local authority accommodation, nor was it found possible to force her to do so under the National Assistance Act.

At noon on December 11 she was noted by a neighbour to be in her usual state, and was found dead in bed the following morning.

At necropsy no organic change of any significance was found. Analysis of her blood, urine, and cerebrospinal fluid showed bromide concentrations of 132 mg., 110 mg., and 105 mg. per 100 ml. respectively. Her stomach contained 850 ml. of fluid, the level of bromine being approximately 125 mg. per 100 ml., precise estimation proving technically difficult. No evidence of barbiturate or of salicylate was found in any of the body fluids.

At the inquest a verdict of accidental death due to carbromal (persomnia) intoxication was recorded.

DISCUSSION

The more serious effects of carbromal overdosage include acute and chronic mental symptoms (Magnussen, 1947; Stroh, 1955), addiction (Barker, 1958; Seager and Foster, 1958; Young, 1958), and death (*Pharm. J.*, 1958a, 1958b), while drug eruption is another complication even with normal dosage (Borrie, 1955; Prosser Thomas, 1958; Young, 1958).

In the present instance the patient took persomnia tablets in large numbers for at least 10 years. Her resultant mental disturbances were well known, not only to those concerned with her medical care but also to the police and to her neighbours. Several hospital admissions were required for the more severe acute toxic episodes, which mainly occurred after she had been left by her husband, who previously had removed an enormous number of persomnia tablets from the house. Nothing effective could be done for her, as she always denied taking persomnia or other drugs, refused to co-operate with every endeavour to control her addiction, and continued to obtain the drug despite the efforts to stop her.

Considerable concern is now felt in this country about the unrestricted sale of carbromal and bromvaletone. The Ethical Committee of the Pharmaceutical Society has recommended that these drugs be included in Part 1 of the Poisons List and First and Fourth Schedules to the Poisons Rules (*Pharm. J.*, 1958c). The Poisons Board was unable to accept this recommendation, and this decision was upheld by the Home Secretary, but the matter has been referred to the Interdepartmental Committee on drug Addiction by the Minister of Health (*Brit. Med. J.*, 1958; *Pharm. J.*, 1958d).

This case emphasizes some of the difficulties of dealing with carbromal addiction under existing regulations, and it is to be hoped that measures will soon be adopted which will improve the present position.

We thank Mr. B. A. Sharpley, H.M. Coroner for the Louth District, for permission to publish the necropsy findings; Dr. A. N. Redfern for many of the details of the case history; and Mr. J. H. Kemp, B.Sc., for the chemical analysis.

MATTHEW STEEL, M.D., M.R.C.P.
J. M. JOHNSTONE, M.D.

Grimsby Group of Hospitals.

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Reviews

ABDOMINAL OPERATION PER VAGINAM

Abdominal Operations by the Vaginal Route. By Paul Werner, M.D., and Julius Sederl, M.D. Translated by L. M. Szamek, M.D. (Pp. 165+vi; illustrated. 65s.) London: Pitman Medical Publishing Co., Ltd. 1958.

In the late 'twenties I was enthralled by the surgical skill of Paul Werner—a skill which I have never seen surpassed—and it has been my regret that the methods of that superb Viennese surgeon have been so little known in this country. At long last this omission has been in part corrected. In collaboration with Julius Sederl, Werner has now presented a detailed account of abdominal operations that can be performed by the vaginal route.

In a lavishly illustrated book of 165 pages the routine—and many of the not-so-routine—operations are minutely described. "Minutely" is the correct word, for a feature of the book is the care taken to expose the many pitfalls and practical difficulties, as well as to describe the detailed steps of each operation. The younger gynaecologist will doubtless be stimulated by the clear text and the superb illustrations; he may also be astonished to learn of the number of abdominal operations that can be performed by the vaginal approach. The older surgeon may also find his interest aroused, and may indeed be jolted out of complacency, by some of the technique described and discussed, much of it controversial, but all of it bearing the stamp of the authors' mature experience.

As one browses through the pages the surgery of pre-war Vienna comes vividly back to mind. But now a cloud of doubt arises. Do all these operations truly reflect present-day gynaecological practice? What can one say, for example, about the removal per vaginam of large ovarian cysts or of tubal pregnancies associated with massive intra-abdominal haemorrhage? About vaginal antefixation of the uterus? About vaginal subtotal hysterectomy? And are myomectomy and morcellement of large fibroids really safe when done by the vaginal route? Here, at least, the authors have a qualm: "If the fundus reaches above the umbilicus and it would be difficult to visualize the operating field . . . we prefer laparotomy." Loyalty to the famous Wertheim, Werner's one-time chief, probably explains why some of these procedures are still advocated; but to present-day gynaecologists in English-speaking countries they may well appear as outmoded and even bizarre forms of surgery. It is difficult to resist the thought that the teaching in this book, while superficially modern, is essentially the reflection of a practice that had its heyday three or more decades ago.

The translation from the German by L. M. Szamek is generally excellent, although in places a little peculiar. What, for example, is the "pavilion" of the tube? By context, the tubal ampulla is probably meant—but why *pavilion?*

I commend this book to all gynaecological surgeons, for it contains, among other good matter, an excellent account of vaginal hysterectomy in its simple and in its more complicated forms. But to the younger worker who has not yet acquired the ability to discriminate between the various methods of gynaecological surgery I must add the warning that, if taken by itself, it is dangerous reading. Without doubt the book is stimulating and instructive; it is also provocative and controversial. If, in a manner of speaking, it can be regarded as newborn infant, it suffers, I fear, from a somewhat post-mature birth.

J. CHASSAR MOIR.

FROM DARKNESS TO LIGHT

From Magic to Science. Essays on the Scientific Twilight. By Charles Singer. (Pp. 253+xxxi; illustrated. 16s.) New York: Dover Publications, Inc. London: Constable and Co., Ltd. 1958.

This book consists of a reprint of a series of essays written by Dr. Charles Singer, the earliest dating back to 1912. The collection in this present edition is preceded by an autobiographical preface consisting of notes on the circumstances in which the essays were written. This is of particular interest to present-day readers by virtue of the light it casts on Dr. Singer's own activities. Since these essays are not easily accessible in other publications this further edition is very welcome, for they represent the conception of the dawn of scientific thought held by our most notable medical historian of to-day.

From the first essay, "Science under the Roman Empire," a consecutive picture is drawn of subsequent mediaeval symbolism, a point of view represented by the "Lorica" of Gildas the Briton, composed "to expel the demons who pestered him," through the dawn of modern science as represented by Roger Bacon. The transition is particularly beautifully described in the essay "Dark Ages and Dawn of Science."

In the chapter "Early English Magic and Medicine" Dr. Singer is concerned with that dark period before the arrival of Arab material in the west, when pure folk-medicine existed in these islands. This provides an admirable example of Dr. Singer's thorough and persistent research into magic and medical practice in early England, scantily represented as it is by scattered fragments of manuscript and folklore. This is traced right back to its sources of origin in Greek medicine, ecclesiastical writings, Salernitan texts, native teutonic magic, herb lore from Southern Italy, Byzantine magic and theurgy, in an account which must form one of the classical synthetic studies of this period.

In the essay on Hildegard of Bingen, Dr. Singer diagnoses the visions of the abbess as examples of migraine superimposed on her knowledge of ancient Greek authorities, and represents her as giving us a picture of "Science of the Dark Ages," just emerging in to the twilight of Arab translations.

In the final chapter on the School of Salerno, Dr. Singer brings us to the threshold of the Renaissance, in his crisp way debunking many falsifications and legends associated with the *Regimen Sanitatis Salerni* and "Dame Trot."

It will be seen that the whole collection of essays takes us from Roman times to the dawn of the Renaissance, a difficult period in medical history and one rarely dealt with by medical historians. A further edition of this book is thus a very welcome contribution to the history of medical science.

K. D. KEELE.

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LIMITATIONS OF B_{12}

The value of vitamin B_{12} in the treatment of megaloblastic anaemias is well established. If the patient's symptoms are due to deficiency of B_{12}, they are abolished or diminished by treatment with it. But, as J. A. Halsted and his co-workers[1] have recently pointed out, vitamin B_{12} has often been given to treat patients in whom characteristic haematological, lingual, and neurological signs of B_{12} deficiency are absent. For example, it has been claimed that vitamin B_{12} benefits children who are underweight, old people, pregnant women, and the chronically ill, as well as patients with hepatitis, skin diseases, trigeminal neuralgia, diabetic retinopathy, and various other neuropathies. The value of treatment with B_{12} in these conditions is doubtful, for reports by different workers are contradictory and the observations on which the favourable claims are based are often inadequately controlled. Furthermore it is difficult to understand why treatment with vitamin B_{12} should benefit these patients unless they are suffering from deficiency of the vitamin.

In patients with deficiency of B_{12} the concentrations of it in the serum are subnormal. The levels fall below the normal range before the characteristic symptoms of deficiency appear, so that subclinical deficiency can be detected by measuring the concentration of B_{12} in the serum.[2] Such studies have failed to show that subclinical deficiency exists in conditions other than the syndrome usually associated with megaloblastic anaemia. For example, the levels of B_{12} in the serum of old and chronically ill patients are either normal[3] or only slightly lower than normal[4]; and, though the level does fall in pregnancy, it rarely goes below the normal range if the diet is adequate.[5] Furthermore, the vitamin B_{12} in the liver does not fall either with increasing age[6] or in such conditions as prolonged sepsis or widespread neoplastic disease.[3]

In diabetic retinopathy and hepatitis, two of the conditions in which vitamin B_{12} has been reported to be beneficial, the mean concentrations of B_{12} in the serum are in fact often above normal. In the diabetic patients the increased concentrations are probably found only if they also have kidney disease,[3] while the increased concentrations in liver disease are usually found when there is active destruction of liver tissue.[7] The concentrations in the serum are sometimes very high in acute hepatitis, and large amounts of the vitamin may be lost in the urine during the acute phase of the disease.[7 8 9] The administration of B_{12} to these patients during convalescence is perhaps justified to restore the depleted liver reserves. The concentration in the serum may also be increased in cirrhosis of the liver,[7 8] though the amount in the liver is usually reduced.[1 6] In some cases the fall in the amount of B_{12} in the liver may be due to inadequate intake of the vitamin, for some of the patients were chronic alcoholics taking a diet deficient in it. But in other cases the fall is probably due to loss of tissue capable of storing B_{12}. Treatment with the vitamin is unlikely to benefit these patients.

The assay of B_{12} in serum has therefore not shown that there is any widespread lack of it in conditions other than the megaloblastic anaemias. Nevertheless, subnormal levels are occasionally found in patients who are not anaemic and who do not complain of the signs and symptoms usually associated with deficiency of B_{12}. These patients usually suffer from subclinical Addisonian anaemia or the so-called latent malabsorption syndrome. They are uncommon, but probably the beneficial effect of B_{12} sometimes seen in patients with neurological disorders is due to the relief of such unsuspected B_{12} deficiency. This, for example, appears to be the reason why some patients with tobacco amblyopia improve rapidly when treated with B_{12}, for the serum B_{12} levels in the patients who respond best are as low as those in patients with untreated pernicious anaemia.[9]

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ALPHA-CHYMOTRYPSIN IN CATARACT EXTRACTION

The description by J. Barraquer in 1958 of the use of alpha-chymotrypsin in cataract extraction led to trial of this method by other ophthalmic surgeons both in Britain and abroad. The ideal method of extracting the lens from the eye is by the intracapsular method whereby the lens is removed complete within its capsule. To do this the suspensory ligament of the lens must be ruptured—a manœuvre normally effected by a combination of traction on the anterior lens capsule and pressure on the surface of the globe. In the aged the suspensory ligament is weak and it tears readily, but in younger patients the suspensory ligament is stronger and the lens capsule is liable to tear before the zonule.

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Cataract is not uncommon in those between 40 and 60 years of age, and in these presenile cases intracapsular cataract extraction may present operative difficulties. Because of its proteolytic action alpha-chymotrypsin weakens the suspensory ligament of the lens. After irrigation of the posterior chamber of the eye with a solution of alpha-chymotrypsin (1 : 5,000) the suspensory ligament becomes soft and will tear readily, while the lens capsule, which is more resistant to the action of the enzyme, remains strong. Other intraocular structures do not appear to suffer damage. The iris and the deep layers of the cornea are protected by their epithelial and endothelial coverings. The vitreous, too, appears to be unaffected, probably because the suspensory ligament itself acts as sufficient barrier.

Recently reports on the use of alpha-chymotrypsin in Britain have been made by J. E. H. Cogan and his colleagues,[2] D. Ainslie,[3] and E. C. Zorab.[4] Between them these authors have treated almost two hundred cases, and no complication which could be definitely attributed to the use of alpha-chymotrypsin was reported. It would appear that this enzyme can be of assistance even in senile cataract extraction, but is of the utmost value in the treatment of presenile cataract and cataract affecting the young adult. Whether it will be as valuable in the treatment of congenital cataract, however, seems doubtful. In infants and children there are often adhesions between the posterior lens capsule and the vitreous face, so that even if the alpha-chymotrypsin completely dissolves the suspensory ligament of the lens intracapsular extraction in such cases is apt to be followed by serious vitreous loss. Certainly much more research will be required before it will be possible to advocate intracapsular extraction as a substitute for the usual method of discission in the early treatment of congenital cataract.

FLUORIDE ON TEETH

The fluoridation of domestic water supplies is helpful in the control of dental caries. It is natural therefore that research workers should seek way and means of bringing this benefit to persons who are not served by public water supplies or have no fluoride in theirs. In studies to determine the mechanism of the action of fluoride W. D. Armstrong and P. J. Brekhus[1] found that there was a significant difference in the fluoride content of sound and carious teeth. This work was carried further when J. F. Volker[2] showed that the solubility in acid of powdered tooth enamel was lessened by first washing the enamel in a sodium fluoride solution. These results were supported by subsequent research in which stannous fluoride was shown to reduce solubility more than sodium fluoride.

For the last twenty years clinical studies based on these laboratory findings have been carried out. Sodium, potassium, and stannous fluoride solutions have been used as topical applications to the teeth at various concentrations and at different *p*H levels. The subjects for these clinical trials have mostly been children aged 6–15 years. The method of control has been to treat one half of the mouth and to compare the caries incidence of the teeth of the treated and untreated sides.

The techniques of topical application of fluoride solutions vary, but all are time-consuming. The widely accepted method of J. Knutson[3] entails, firstly, a thorough cleansing and polishing of all teeth, secondly, isolation of the teeth of one quadrant of the mouth at a time, thirdly, drying of these teeth with compressed air, fourthly, wetting of the whole crown surfaces of the teeth with a fluoride solution, paying special attention to the areas between the teeth, and fifthly allowing the fluoride solution to dry on the enamel surface for at least four minutes. This treatment is repeated four times during a period of several weeks. A neutral freshly made solution containing 2% sodium fluoride is recommended. Each full treatment is probably best given at the ages 3, 7, 11, and 13 years, so that the teeth of the first and second dentitions will be treated soon after eruption.

The results of the clinical studies with sodium fluoride have shown a reduction in the incidence of dental caries in the range of 10–40%. The different results are said to be due to the various techniques employed, and this possibility is borne out by the painstaking work of G. Bergman.[4] He found that by using a sheet-rubber dam to isolate each tooth from contact with saliva a greater protective effect against dental caries was obtained. Bergman applied a 2% solution of sodium fluoride four times only and reported that the inhibition of caries was 60, 50, and 40% after 1, 2, and 3 years respectively.

The clinical testing of a 2% solution of stannous fluoride in Great Britain by G. L. Slack,[5] using a technique similar to Knutson's, has given a reduction of about 21% after two years. W. A. Jordan and colleagues,[6] in the U.S.A., have reported that a single application of an 8% solution of stannous fluoride has in one year given a reduction of 20%. To what extent these results could be improved upon by the use of the rubber dam is difficult to judge.

The reports show that a significant reduction in the incidence of caries can be expected from the topical application of a fluoride solution, though information is still incomplete on how often it is best applied, the permanency of protection, and the most effective fluoride solution to use. It has been argued that the procedure takes up too much time for the benefit conferred, and that dentists' time is better spent on proved reparative operations. Although to some extent this may be true, any reduction in the incidence of caries is valuable and deserves attention. It is to be hoped that further research will prove fruitful in this promising field of preventive dentistry.

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Correspondence

Because of heavy pressure on our space, correspondents are asked to keep their letters short.

Adoption Act

SIR,—Certain new regulations came into operation under the Adoption Agencies Regulations 1959 on April 17, 1959. S.I. No. 639 of 1959 states under the Fifth Schedule, Section E, "Result of suitable serological test of the child's blood for syphilis taken six weeks or later after birth."

This requirement is causing considerable concern to many of us who have to deal with a considerable number of adoptions. It seems to us that, in these days when congenital syphilis is practically unknown and when every mother has a Wasserman reaction during pregnancy, this assault upon infants is undesirable. This requirement will also delay considerably adoption procedure and is likely to lead to increased emotional disturbance in young unmarried mothers. Financial hardship to these young mothers will also be more marked and there will be more trouble and disruption in their own homes. Adopting parents will be faced with receiving an older child and will thereby miss the early weeks of babyhood which mean so much to many of them.

It appears that one reason for this new regulation is that it is possible for a serologically positive mother to produce a baby which is serologically negative at birth but which may be positive after the first six weeks of life. But serologically positive mothers are very rare and it would surely meet the case if the babies of these mothers only were to be subjected to this further test. This seems to be another example of ill-conceived and ill-informed encroachment upon the liberty of the individual.—I am, etc.,

ALAN S. OGDEN.

Penicillin in Scarlet Fever

SIR,—May we offer a few comments on the paper by Drs. Elli Jansson and Erkki Klemola (*Journal*, May 30, p. 1382) on a series of 7,837 cases of scarlet fever admitted to hospital?

At the beginning of the article they say "before the use of antibiotics second attacks were uncommon." Surely this is incorrect, for early second attack rates as high as 7% have been recorded prior to 1947, and are accounted for by the existence of two antigenically distinct types of erythrogenic toxin.[1]

Drs. Jansson and Klemola show that the number of early secondary attacks was highest in the years when there was an epidemic of scarlet fever, as might be expected since the population at risk was then greatest and opportunity for cross-infection in hospital maximal. The continued appearance of late secondary attacks can also be accounted for by the increased size of the population exposed to risk since only those whose first attack occurred after January, 1947, were under investigation.

They demonstrate that late secondary attacks are most frequent in children whose first attack occurred below the age of 6, and were rare where the age at first attack was over the age of 15. Since Gordon[2] has shown that young infected children are 11 times more prone to infect others than are adults, it seems more probable that this is due to absence of exposure to risk of infection in schools (particularly infant classes) than to the gradual immunizing effect of subclinical infections reducing the effect of penicillin on immunity.

The limited duration of the period of observation results in the population exposed to risk of late second attacks after different intervals being least for the longest interval, and the time elapsing between onset of disease and the institution of penicillin treatment may well be related to the age of the patient. From this evidence, therefore, it would seem unwise to deduce that penicillin treatment influenced the development of immunity. It is possible, however, that such an effect could be demonstrated by a comparison of third or subsequent attack rates in a group who did and a group who did not receive penicillin treatment, if cases were randomly selected for the two groups.

The difficulty in drawing deductions from this research springs from the protean nature of so-called "scarlet fever". The authors admit that in 1956 59% of cases were treated at home, and were outside the scope of their article. No mention is made of haemolytic streptococcal throat infections without rash, and one presumes that these are not notifiable in Finland.

One of us (T. H. Kirk[3]) reported an incident in which a large family was infected with haemolytic streptococci, Type A, Group 14, in which several members developed typical scarlet fever and others tonsilitis without rash. It was the latter who developed complications (nephritis) leading to one death several years later. This drew a leader in the *Medical Officer*[4] which discussed the latter and stated "One objection to the notification of scarlet fever is that the term covers many—at least 36—different infections, none of which is separable from other manisfestations of the same infection." The leader ended with a plea for alteration of the rules of notification, and for regular periodic review of the list of notifiable diseases. This need is still as great today.—We are, etc.,

Barton-on-Humber, Lincs. T. H. KIRK
J. S. ROBERTSON

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SIR,—Dr. Elli Jansson's and Dr. Erkki Klemola's interesting paper on penicillin and scarlet fever (*Journal*, May 30, p. 1382) leads to conclusions very much related to my experience in about 5,000 cases of scarlet fever in the last 11 years, where I have seen a growing number of late secondary attacks. However, I do not think penicillin should be routine treatment in scarlet fever; and, owing to this, in my cases the connexion between early penicillin treatment and second attacks is still more obvious. Only about 20 per cent. of my patients receive early penicillin, but the majority of secondary attacks are among them.

My reluctance to treat *all* scarlet fever patients with penicillin from the very beginning is based on the following considerations: (1) Many cases show no response to the antibiotic (due perhaps to inactivation by concomittant penicillinase-producing organisms or to true resistance of strains of streptococci). (2) The incidence of penicillin hypersensitivity is reduced. (3) There is less production of penicillin-resistant staphylococci in a ward with many small children. (4) Very many cases of scrlet fever show an uneventful course without penicillin. A close watch of the temperature chart and general behaviour makes it possible in the great majority of complicated cases to staft the

penicillin treatment sufficiently early to prevent more serious developments.—I am, etc.,

Infectious Diseases Clinic, Danzig, Poland. VICTOR BINCER.

Tobacco Amblyopia

SIR,—In your annotation on tobacco amblyopia (*Journal*, June 20, p. 1582) it is stated that there is no record of cigarette-smoking causing the disease. I have seen a case of a woman, aged 40, a very heavy cigarette smoker who developed typical centrocaecal scotomata. She proved to be a diabetic, and her vision returned to normal when her health improved. I doubt if she ever completely stopped smoking. I believe I saw a similar condition in a man some years ago, but I have not yet traced my notes of the case.—I am, etc.,

Cavan. FREDERICK P. E. SMITH.

Spinal Analgesia in Obstetrics

SIR,—I do not wish to deal with the very complex subject of anaesthesia for emergency caesarean sections, but with the more common cases requiring forceps delivery. These anaesthetics are always a matter of great urgency. So often a very junior anaesthetist is summoned by an excited midwife, on the instructions of an obstetrical registrar, who is usually senior in "status" to the anaesthetist. The anaesthetist is immediately told to "get on with it and get the patient under." In the circumstances a bad anaesthetic is often given, sometimes with a disastrous result for the mother.

I do not agree with Drs. Wingate and Ball (*Journal*, May 2, p. 1185), who state the common complications from *high* spinal analgesia—namely, shock and hypotension—and those from inadequate asepsis—namely, meningitis and headaches. Mr. H. Vincent Corbett is also obviously worried about the medico-legal aspect of spinal analgesia (*Journal*, May 2, p. 1184). When using the saddle block, so adequately described by Mr. R. T. Sears (*Journal*, March 21, p. 755), and with a proper aseptic technique, these complications are extremely rare. Caudal analgesia is very much less certain in its action than spinal analgesia, and in the obese full-term patient can be technically an extremely difficult procedure.

Pudendal-nerve block in combination with pethidine and self-administered trichloroethylene analgesia has recently been described (Dr. P. A. S. Sahay, *Journal*, March 21, p. 759) which to my mind is a very much simpler technique than caudal analgesia. I am quite sure that obstetrical housemen and registrars would be more than grateful for a short period of instruction in both spinal analgesia and pudendal-nerve block technique, to enable them to do without the necessity of calling on members of their anaesthetic department, who are not always available at a moment's notice.

When one is dealing with the African patient I consider that local methods of analgesia are all the more important. One can rely very little on the history, and nearly all cases requiring emergency obstetrical procedures seem to have not only full but dilated stomachs, and when general anaesthesia has to be administered I always insist on a full-size stomach tube being passed prior to induction of anaesthesia. On more than one occasion I have been called urgently after an open ethyl chloride/ether anaesthetic to pass a bronchoscope on a patient. On arrival the patient was obviously dead, and at necropsy the trachea and both main bronchi were packed with inhaled vomit. On another occasion more than six pints (3.4 litres) of fluid were produced just after induction of anaesthesia, the majority of which was inhaled.

In my opinion low spinal analgesia or pudendal-nerve block are the methods of choice for all emergency obstetrical procedures excluding caesarean sections, particularly in the African patient.—I am, etc.,

Pietermaritzburg, S. Africa. J. D. M. BARTON.

Communicating Measles

SIR,—Protection of the young against measles has also something of an antiquarian flavour. "This epidemic disease," says a Mr. J. Cook, writing in the *Gentleman's Magazine* for April, 1767, "should be communicated to those young subjects who have not yet had it." The method, he says, is easy, may be performed with safety by a careful nurse, and is not attended by the remotest danger.

"Dip only a little bit of cotton, or lint, in the watery humour that stands in the eyes of persons ill of the measles about the time of the crisis, make a slight scratch in the skin of the arm, above the elbow, of the person to be inoculated, put the wetted pledget upon the incision, and cover it with a bit of sticking plaister to keep it on; and this, without farther trouble, will produce the measles in a gentle and favourable degree, which, during the whole course of it, will want no other care but that of keeping the patient moderately warm, nor any attendance but that of watching the fever, and encouraging the crisis, which, in a few days, will carry off the infection, and compleat the cure."

—I am, etc.,

London, W.1. RONALD JESSUP.

Ovarian Pregnancy

SIR,—With reference to the interesting memorandum on a case of primary ovarian pregnancy by Drs. Jane Fullerton and Margaret Salmond (*Journal*, April 19, 1958, p. 932) I would mention a case I operated upon five years ago.

A married woman, aged 26, was admitted to our hospital in 1953, complaining of heavy bleeding and abdominal pain. The history revealed two parturitions and one abortion. Having missed two of her menses and troubled with continuous vaginal bleeding, she had consulted a local midwife, who suggested hot baths. After a temporary improvement her condition grew worse, the heavy bleeding with associated abdominal pains started again, and she was taken to the hospital.

Gynaecological examination revealed abdominal tenderness, most marked in the lower quadrants, with no perceptible rigidity, and a suprapubic mass. Owing to acute tenderness of the genital organs a vaginal examination proved ineffective; consequently, the impression at the time was of an inflammatory process. However, an exploratory puncture through the abdominal wall disclosed blood, and it was decided to perform a laparotomy. Approximately two litres of blood found on opening the abdomen were autotransfused. Both tubes were found intact. A haemorrhagic area about the size of the half-dinar (sixpence) was located on the left ovary. The uterus was enlarged and soft. A left salpingo-oophorectomy was performed.

On the tenth post-operative day the bleeding started again, the patient alleging that the foetus had been expelled. On the eleventh day a fair amount of placenta-like tissue was removed by curettage. The impression at the time was abortion of intrauterine foetus with the placenta, and the abdominal bleeding was ascribed to a corpus luteum of pregnancy. A few days later, however, we received the following histological report: Ovarian pregnancy. The enlarged ovary shows a shallow defect with a brown bottom the size of a little finger-nail. In the vertical section of the ovary with the defect, a large corpus luteum has been found.

Lutein as well as decidual cells and a few typical chorionic villi can be observed in the walls of the defect in question. (Professor Kopač, Institute of Pathologic Anatomy, Medical School of Sarajevo University.)

It occurred to me at the time that the pregnancy might well have been a dual one, i.e., ovarian and intrauterine simultaneously, and I regret not having sent the tissue obtained by curettage for histologic examination. At laparotomy we omitted to search for foetus or foetal sac, since we had assumed that we were concerned with a case of common ectopic pregnancy. After the removal of blood from the abdominal cavity we proceeded to examine the tubes in search of the cause of bleeding, without paying much attention to clots. Unfortunately the histological report was received after the curettage had been done, which is why the supposed placenta was not sent for a histological examination.—I am, etc.,

Travnik General Hospital, Travnik, Yugoslavia

PAUL KOPASZ.

Breast Abscess

SIR,—The contribution by Mr. Ian C. S. Knight and Mr. Bernard Nolan (*Journal*, May 9, p. 1224) and the letter from Drs. John Woodall and E. Tuckman (*Journal*, June 13, p. 1529) together emphasize the important difference which is developing between surgical staphylococcal infections contracted in hospitals and similar infections contracted in general practice. The letter to you says, "we doubt very much whether the causative organisms in general practice are as insensitive to penicillin as were the hospital staphylococci which they isolated." There need be no doubt at all. We have isolated many staphylococci from lesions contracted in general practice. Up to 30% may have considerably *reduced* sensitivity, but under 1% show the complete resistance which is commonly found in the hospital wards.

Many practitioners insist (with Drs. Woodall and Tuckman) that breast abscess is much rarer in women delivered at home than in those delivered in hospital, and, judging by those treated in the casualty department in Sunderland, I think this must be true. It is unlikely that this is due to any association between antibiotic resistance and pathological virulence in the staphylococci concerned. It is mainly due to the continued and careful "breast management" in which your practitioner correspondents take a proper pride. Lactation abscess is very often the direct result of milk retention, and in this I think your contributors and your correspondents entirely agree. I suspect many hospital-delivered patients go home and think they can "manage" themselves. The fact that anyone can buy stilboestrol tablets by going into a chemist's shop and asking for them does not help. They are often prescribed by the neighbours and in altogether inadequate doses.—I am, etc.,

T. G. LOWDEN.

Old-fashioned Remedies

SIR,—In these ultra-scientific times one expects the old remedies slowly to be forgotten, but there are some which are surely worth keeping.

I have the impression, from conversation with both hospital casualty officers and young general practitioners, that few now treat sprains and incipient bruises (especially around the eye) by applying iced water and very hot water alternately for at least fifteen minutes, and following this with tr. arnicae or liq. hamamelidis liberally applied. Since this certainly gives splendid results I would be interested to hear why it is no longer taught or practised.—I am, etc.,

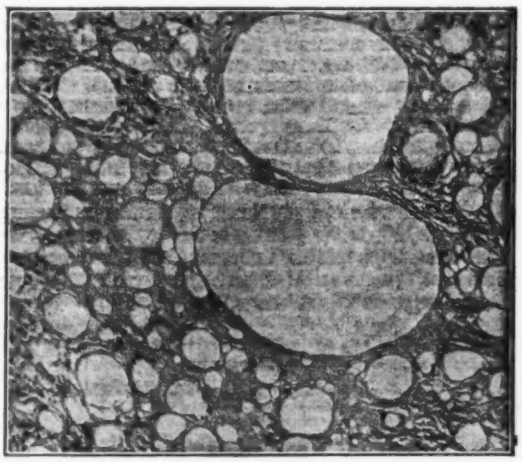
St. George's Hospital, London, S.W.1

J. C. MCFADDEN.

Paraffinoma of Prepuce

SIR,—Reports of the deliberate injection of oil into the male genitalia are comparatively few. Quēnu and Pērol[1] were able to collect only five cases in which the injections were made into the penis. A further case of this condition is now reported.

The patient, a 40-year-old joiner, reported to the V.D. Clinic, Liverpool Royal Infirmary, in October, 1958. Some three weeks earlier he had found a package containing an unused metal glass syringe (? 2 ml.) together with two hypodermic needles. On reaching home, he half-filled the



syringe with medicinal liquid paraffin and injected the contents into his prepuce. This apparently caused little pain, but subsequently the prepuce gradually became thickened and swollen until he was unable to retract it. He now complained of difficulty in passing urine. Examination revealed a phimotic prepuce markedly thickened and oedematous distall ybut comparatively unaffected nearer the root.

He was admitted to hospital with a view to circumcision. Urine examination, however, revealed a heavy glycosuria, and his fasting blood sugar was reported as 205 mg./100 ml. Blood W.R. was negative. Stabilization of his diabetes delayed operation for five weeks, during which time the appearance of his prepuce remained unchanged. At operation (Mr. D. P. B. Turner) the whole of the affected prepuce was removed and a section sent for histological examination. This revealed the typical appearances of a mineral-oil granuloma or paraffinoma (see Fig.—× 60). Healing was rather slow, but at the end of three weeks he was fit for discharge. A month after discharge the circumcision was soundly healed, but one or two small firm nodules could be felt in the subcutaneous tissue a little proximal to the suture line.

At no time could the patient be persuaded to supply any motive for his behaviour. He was unmarried and denied sexual intercourse at any time. There was a history of "nervous breakdown" in adolescence, but subsequently he had enjoyed good health and had worked for the same firm for the last twenty years.

The development of a paraffinoma following the injection of such a small amount of material—probably

not more than 1 ml.—accords with the experimental investigations of Nairn and Woodruff,[3] who were able to produce a classical paraffinoma reaction in rabbits following the subcutaneous injection of as little as 0.1 ml. of liquid paraffin. The histology in this case is very similar to that produced experimentally in the rabbit when examined at a roughly similar period.—I am, etc.,

Liverpool Royal Infirmary, Liverpool C. D. ALERGANT.

REFERENCES

[2] Quénu, J., and Pérol, E., *J. Chir. (Paris)*, 1947, **63**, 345.
[3] Nairn, R. C., and Woodruff, M. F. A., *Ann. Surg.*, 1955, **141**, 536.

Stammerers Wanted

SIR,—I am starting a research project on stammering and am anxious to gather 50 subjects of either sex, irrespective of neurotic traits, between the ages of 10 and 30 years, for investigation.

The project has a combined clinical and theoretical aim and will involve seeing each subject once a week for a period of two months to give them treatment based on the research of Cherry, Sayers, and Marland,[4] over and above other investigations concerned with cerebral dominance, personality characteristics, general developmental factors, and auditory feed-back systems. It will be explained to each patient that he or she will be forming part of a research series, and every effort will be made when I have completed my investigations to arrange further treatment for them.

I would be most grateful if any doctors in the course of general or hospital practice who come across stammerers would be kind enough to refer them to me in the Department of Adult Psychiatry, at St. George's Hospital, 15, Knightsbridge, London, S.W.1.—I am, etc.,

London, S.W.1 BERENICE KRIKLER, Senior Psychologist,

REFERENCE

[4] Cherry, C., Sayers, B. McA., and Marland, P. M., *J. psychosom. Res.*, 1956, **1**, 233.

Mortality from Leukaemia

SIR,—Drs. W. M. Court Brown and R. Doll (*Journal*, April 25, p. 1063), in "recasting" the leukaemia mortality statistics, treat all acute leukaemias as a single entity. Difficulties of cytological diagnosis, with consequent divergence of opinion and muddled nomenclature, fully justify such an approach in statistical surveys, which of necessity rely on a mixed bag of diagnostic opinion. However, it imposes severe limitations on the scope of investigation, for a statistical study of a property, such as age distribution, of a cytologically, clinically, and probably aetiologically heterogeneous group of diseases, as an entity, can only be useful if the components of the group happen to show a common tendency, i.e., be homogeneous, in respect of the property studied.

In the paper under discussion, age distribution is treated in this way, all acute leukaemias being represented by a single curve. The question arises, have various types of acute leukaemias comparable age distributions?

The authors refer to, and apparently accept, the not dissimilar "bimodal" curves of age distribution of the three main types of acute leukaemia in a statistical survey of records from 33 Brooklyn hospitals and death certificates by MacMahon and Clark who subdivided acute leukaemias cytologically and studied age distributions of the acute myelogenous, lymphatic, and monocytic types individually. However, these American workers admit that their material had at least two defects: (1) the cytological diagnosis was confirmed "by bone marrow biopsy *or* autopsy" in only two-thirds of cases of acute leukaemia (494 out of 726). This alone invalidates more than a third of their material, for it is generally accepted that a reliable cytological diagnosis of acute leukaemia cannot be made without bone marrow examination. (2) "It has been necessary of course to accept the diagnosis of individual pathologists, recognizing that this entails some variation in criteria." To realise how unpredictable these "variations in criteria" can be, it is sufficient to mention the notorious argument concerning the so-called "Naegeli-type monocytic leukaemia," which some authorities regard as a variant of acute myeloid leukaemia and others as that of monocytic leukaemia. Quite often the type of acute leukaemia is not even stated fully in the diagnosis, especially on death certificates.

The above two defects of MacMahon and Clark's material make their cytological subdivision and age distribution curves of acute leukaemias quite unreliable. In fact, there is a good reason to believe that age distributions of the three main types of acute leukaemia, at least in this country, are quite dissimilar, and different from those demonstrated by the two American workers. Bodley Scott's[2] results in respect of acute leukaemias, coming as they do from a single, highly competent, diagnostic source, are more reliable than those of any broad statistical survey, in the present state of confusion regarding this subject.

It is my contention, therefore, that time is not yet ripe for statistical studies of age distribution, and of many other properties, of acute leukaemias on the material from broad statistical surveys.—I am, etc.,

St. James' Hospital, London, S.W.12. A. SWAN.

REFERENCES

1 MacMahon, B., and Clark, D., **Blood**, 1956, **11**, 871.
2 Scott, R., Bodley, **Lancet**, 1957, **1**, 1053.

To-day's Drugs

With the help of expert contributors we publish below notes on a selection of drugs in current use.

Senokot (Westminster Laboratories).—This is a preparation of the glycosides of senna pods, and, being standardized, provides a constancy of action per dose which is unobtainable from the pods. It is available as granules or tablets.

Like all the anthracene purgatives, senokot acts about six hours after ingestion. This was thought to be due to the arrival of the drug in the colon, and its action was ascribed to irritation of that section of gut. This view has been shown by animal experiments with senokot to be incorrect. No inflammatory changes are produced in the intestinal mucosa even after heavy dosage over several days. In fact the active principles are absorbed from the small intestine and excreted in the colon, where they exert their action possibly as the result of interaction with bacterial flora. Purgation is thus the outcome of stimulation, muscular or neuromuscular, and not of irritation. Suitable doses produce a formed soft stool. Griping is less common after senokot than after the use of the cruder preparations of senna.

The therapeutic indication is constipation, and the aim should be to administer the minimal effective dose. This can be accurately adjusted by the use of the granule form: 1–2 teaspoonfuls for an adult and half this quantity for children. When the suitable dose has been determined a tablet or two of corresponding quantity can be conveniently prescribed. There are no contraindications provided the constipation is not due to organic disease. Correction of bowel habit by attention to diet, intake of fluid, and exercise should always be preferred to the use of any purgative.

Obituary

O. L. V. S. de WESSELOW, D.M., F.R.C.P.

Professor O. L. V. S. de Wesselow, emeritus professor of medicine in the University of London, and consulting physician to St. Thomas's Hospital, died at the hospital on July 6. He was 75 years of age.

Owen Lambert Vaughan Simpkinson de Wesselow was born on September 21, 1883, the son of the Rev. C. H. S. de Wesselow. From Haileybury College, where he held a senior classical scholarship, he entered Corpus Christi College, Oxford, where he obtained first-class honours in natural science and in physiology. He went on to St. Thomas's Hospital medical school with a university scholarship, and gained prizes in medicine, forensic medicine, and public health, and the Wainwright and Toller prizes during his final year as a student. Graduating B.M., B.Ch. in 1908, he took the M.R.C.P. in 1912, was elected F.R.C.P. in 1922, and proceeded D.M. in 1932. After graduation de Wesselow held in turn the appointments of house-physician, resident assistant physician, and medical registrar at St. Thomas's Hospital. He also studied for some time in Paris, at the Salpetriere Hospital.

Appointed senior assistant at the King Edward VII Sanatorium, Midhurst, in 1913, he also worked voluntarily at the Lister Institute until the outbreak in 1914 of the first world war, in which he served throughout in the R.A.M.C. For nealy two years he was a medical officer to an infantry battalion, being mentioned in dispatches, and for some time he was in charge of the medical division of a general hospital. Later he was detailed for research under the Trench Nephritis Committee, and thereafter he worked at Etaples and elsewhere in conjunction with the late Professor Hugh Maclean, whom de Wesselow was to succeed as chemical pathologist at St. Thomas's after the war. Their investigations established the value of renal efficiency tests and formed the basis of a special report of the Medical Research Committee entitled "Albuminuria and War Nephritis among British Troops in France." In 1920 de Wesselow was co-author with Maclean of a famous paper on a new test of renal efficiency—the urea concentration test. In 1931 de Wesselow succeeded Maclean into the chair of medicine at St. Thomas's, and when he retired in 1948 the title of professor emeritus was conferred upon him, and he was also appointed consulting physician to the hospital.

For some years de Wesselow acted as secretary to the Child Life Committee of the Medical Research Council, and in 1928 he was appointed a member of the departmental committee on maternal mortality, which presented its final report in 1932. In 1934 he delivered the Croonian lectures, on arterial hypertension, before the Royal College of Physicians of London, of which he was later a member of the council. He examined in medicine for the universities of Oxford and London and for the Conjoint Board, and for many years he was a member of the British Pharmacopoeia Commission. He wrote, in collaboration with Mr. J. M. Wyatt, a book entitled *Modern Views on the Toxaemias of Pregnancy*, which was published in 1924 as the second in a series of books edited by Professor Maclean under the general title of *Modern Medical Monographs*. In the same year he published a book entitled *The Chemistry of the Blood in Clinical Medicine*. He also contributed numerous articles to the literature, and was himself for a time an editor of the *Quarterly Journal of Medicine*. During the second world war he was a section hospital officer in the Emergency Medical Service.

Professor de Wesselow was twice married. His first wife, Margaret, daughter of Sir Charles Cranfurd, died in 1948. They had one son. His second wife, formerly Mrs. Barbara Barratt, survives him.

We are indebted to Sir Arthur MacNalty for the following appreciation:

Owen de Wesselow was a descendant of the Vaughans and exemplified the hereditary genius of that family which has produced several eminent members of the medical profession, including Sir Henry Halford and Sir Charles Vaughan, the first British Ambassador to the United States. At Oxford, where de Wesselow in 1905 took the best first of his year in physiology, his contemporaries realized that a great future lay before him, while his teachers and colleagues at St. Thomas's Hospital soon appreciated his merits. After holding resident appointments and the medical registrarship at his hospital, he had further clinical experience at King Edward VII Sanatorium, Midhurst. But he saw possibilities in biochemistry and began research work at the Lister Institute. Then came the war in 1914. Intensely patriotic, de Wesselow at once joined the R.A.M.C. and served in the trenches with the Worcesters, being wounded and mentioned in dispatches. Sir Wilmot Herringham and Sir John Rose Bradford then insisted on de Wesselow resuming his research work—he had previously refused the appointment of assistant physician at his hospital—and his work begun in France on nephritis and blood diseases established his reputation as a brilliant biochemist, and led eventually to his appointments as director of the medical unit, physician to St. Thomas's Hospital, and professor of medicine in the University of London.

De Wesselow was an effective and popular teacher in the wards, a fair and able examiner in medicine, and a physician whose advice and judgment were valued on committees, and, especially, on the British Pharmacopoeia Commission. An authority on the toxaemias of pregnancy, he served on the Departmental Committee on Maternal Mortality. He was also consulting physician to the Board of Control and a member of the Nutrition Committee of the Ministry of Health. In the second war he did admirable service as sector hospital officer (Surrey) and contributed to the *Official Medical History* of that war. Retiring in 1948 with the title of emeritus professor, de Wesselow lived first near Andover and afterwards at Winchester, where he grew roses and took an active part in local affairs.

Owen de Wesselow was singularly unassuming and perhaps too often concealed his light under a bushel. Among friends he was a witty conversationalist and, on occasion, could express his views trenchantly. Kind and generous, he was beloved by his patients and students and had high ideals and integrity. In his younger days he climbed every year in Switzerland and was a member of the Alpine Club. He was also a keen entomologist, an authority on military history and archaeology, and a collector of first editions and old silver. Many will sorrow for the passing of a beloved physician: and our sympathy goes out to his widow and to the son of his first marriage, Squadron Leader C. P. C. de Wesselow, D.S.O., D.F.C.

Dr. H. K. GOADBY writes: My first contact with de Wesselow was as a student in 1925, when he was junior to M. A. Cassidy and chemical pathologist to St. Thomas's Hospital. To housemen and students alike he was always friendly and polite, even when exposing their ignorance in his own special line of chemical pathologyy, then in its early days. When he was elected professor of medicine in 1933 and director of the medical unit in St. Thomas's Hospital, it was my good fortune to become his deputy for the next four years. It was a relief to him not to have to do private consulting practice, though in this he was not only a good clinical opinion but was also able to give extra help from the biochemical aspect of disease.

He took great personal interest in all the sixty ward cases under his care, and was a particularly keen teacher of undergraduate students. On the ordinary run of medical cases his rounds were a model of clarity; in addition, his teaching of chemical pathology was original and in advance of his time. In those days there were no big units with their many assistants and technicians, and research work was more individual. Naturally his special interests lay in such conditions as renal disease and diabetes mellitus, and all other members of the staff, especially the obsteterical department, called him in for such problems. As a director he expected his staff to develop their own problems in their own ways, such men as C. L. Cope and R. S. Stacey passing through his hands.

In personality he was a robust conservative: he never even owned a car when in consulting practice. His honourous vituperation against humbug, unscientific approach to medicine, and any pompous medical aristocrat was a joy to hear at our unit teas. He had many other interests: he was a keen member of the Alpine Club, made a speciality of roses in his own garden at Epsom, and his collection of chalk-blue butterflies was renowned. Right up to his last illness, which he bore with characteristic cheerfulness, his mind was clear and his wit keen.

D. T. McDONALD, M.D.

Dr. D. T. McDonald, who was in general practice at Belford, Northumberland, for well over thirty years, died suddenly on June 14, in the church of which he was an elder.

David Thompson McDonald was born on August 3, 1896, the eldest child of the late Dr. James McDonald, and was educated at George Watson's College, Edinburgh. During the first world war he obtained a commission in the Northumberland Fusiliers, and saw service in Egypt, Palestine, and France. On demobilization he resumed his medical studies at Edinburgh and, after winning a number of medals, graduated M.B., Ch.B., with first-class honours, in 1922. He then held a resident appointment at Edinburgh Royal Infirmary under Professor Edwin Bramwell before joining his father in practice at Belford. He proceeded to the M.D. in 1935. His youngest brother, Dr. W. M. P. McDonald, joined the practice in 1933, but died in 1955.

A stalwart supporter of the British Medical Association, Dr. David McDonald was chairman of the North Northumberland Division in 1931-2; honorary secretary of the Division from 1936 to 1954; president of the North of England Branch in 1951-2; a representative at the Annual Representative Meeting on sixteen occasions from 1938 to 1957; and a member of the General Medical Services Committee from 1949 to 1955 and of the Private Practice Committee from 1944 to 1950. He was also on the mileage committee set up by the Minister of Health, and was appointed by the Ministry to serve on various disciplinary committees. He was a member of the Northumberland executive council from 1950 to 1956, of the local medical committee for Northumberland for many years, and of the hospital management committees for Berwick and for the Northgate and District Hospital, Morpeth. Recently he was appointed to the Home Secretary's committee of inquiry into the practice and legal consequences of human artificial insemination.

Dr. McDonald was twice married: first to Miss Katie Hunter, of Belford, and then to Daphne, youngest daughter of Sir Henry Thompson, professor of physiology at Trinity College, Dublin. He leaves a widow, and a daughter and a son of the first marriage. The deep sympathy of a large circle of friends and patients is extended to his family in their bereavement.

H.S.B. writes: The death of Dr. D. T. McDonald ends the family's seventy years' medical link with the village of Belford. He was an idea country practitioner, who took an active interest in local affairs and the people. He combined a very high standard of medical skill and ability with a genial and kindly temperament which earned the confidence, gratitude, and affection of his patients and their friends. One of his patients, mentioning his death in a letter, referred to "the loss of our beloved doctor"—a brief but eloquent tribute. Despite the many outside calls upon his time he retained his interest in local activities as president of the British Legion, president of the gardens association, a justice of the peace on the Belford bench, and also as medical officer of health, an office he had held since 1924. Unfortunately during the past two or three years the state of his health had been a source of anxiety. Of necessity he had to reduce his activities and to depend on his partners for some relief from the more exacting demands of the practice. As a final tribute I would like to say that he was one who set a high standard for himself in whatever sphere he was engaged, and he expected others to live up to it. Whether in committee or in the performance of his professional work he was scrupulous and painstaking to a degree.

Medical Notes in Parliament

Merit Awards

The MINISTER OF HEALTH gave Mr. K. ROBINSON (St. Pancras North, Lab.) the following details of the distribution of merit awards among consultants in England and Wales in general medicine, general surgery, and mental health, at the end of 1958.

Specialty*	No. of Consultants	Awards			
		A	B	C	Total
General medicine ..	838	61	155	259	475
General surgery ..	862	59	144	256	459
Mental health ..	631	7	23	63	93

* Consultants practising in more than one specialty are counted in both

Doctors' Discipline—In the House of Commons on July 13, MR. M. LIPTON (Brixton, Lab.) asked the Minister of Health why the names of doctors fined by executive councils of the National Health for neglect of duty were not published. MR. D. WALKER SMITH (Hertford East, C.) replied, "Because the procedure, which is thought to reflect the balance of the public interest, does not so provide except where a doctor is excluded by a decision of the National Health Service Tribunal from practising in the Services".

Universities and Colleges

UNIVERSITY OF OXFORD

In Congregation on March 10 Dr. Alice M. Stewart was reappointed Reader in Social Medicine in the University from October 1, 1959, to September 30, 1966.

UNIVERSITY OF CAMBRIDGE

The following candidates have been approved at the examination for the degree of M.Chir.:

K. P. Abel, J. Fairgrieve J. D. Marsh, P. P. Philip, P. S. Reay-Young, J. T. Rowling, C. Shaldon, J. P. Williams.

In Congregation on March 7 the following degrees were conferred:

M.Chir.—P. S. Reay-Young (by proxy).

M.A.—Cicily M. Clarke, M.B., Ch.B., D.C.H., Assistant in Research in Medical Psychology.

M.B., B.CHIR.—A. Kenyon.
M.B.—P. W. Clements (by proxy), G. E. T. Raine.

The consultant staff of the United Cambridge Hospitals have appointed Mr. J. F. R. Withycombe to be a member of the council of the Medical School until December 31, 1962.

The following degrees were conferred on March 21 and 23:

M.D.—P. B. C. Matthews, P. D. Trevor-Roper, N. T. Holden, J. H. Ross.
M.B., B.CHIR.—R. E. Mackie.
M.B.—J. G. D. Simpson, S. O. Suite.

In Congregation on May 16 the following degrees were conferred:

M.CHIR.—J. T. Rowling.
M.B., B.CHIR.—*By proxy*: S. A. Janmohamed
M.B.—J. E. Banatvala, A. J. R. Anderson.

Medical News

'What Do You Know?'—DR. R. WEBSTER, of Todmorden, Lancashire, has won the B.B.C.'s 1959 general knowledge competition, and the title, 'Brain of Britain, 1959'. Among other correct replies he gave the meaning of 'Fianna Fail', 'Sinn Fein', and 'ecdysiast'; knew the concluding words of Thackeray's 'Vanity Fair'; the source of the dye called orchil; who the Bard of Twickenham was; what 'spirits of hartshorn' is; what one would have done if one had committed 'jactitation of marriage'; and named all the halogens.

Ciba Foundation—The names of the 1959 prize winners in the final year of the Foundation's five-year programme of awards for research relevant to problems of ageing have now been announced. The prize of £400 has been awarded to Professor J. F. DANIELLI, of London. The two winners of £300 prizes are DR. R. HINCHCLIFFE, of London, and DR. G. C. WOOD, of Leeds. DR. J. GROSS, of Boston (Mass.), receives the £200 prize. Five of the six £100 prizes go overseas, the other has been awarded to DR. ESTHER C. JONES, of Birmingham.

M.R.C.'s Environmental Hygiene Research Unit—The Unit will be disbanded when DR. T. BEDFORD, D.SC., retires from the Council's staff on September 30.

D.G.A.M.S.—SIR ALEXANDER DRUMMOND'S tenure of appointment as Director-General, Army Medical Services, has been extended to April 4, 1961.

Nuffield Foundation Grant—The Foundation has made a grant of £50,000 over three years, for a scheme of research into the problem of fibroblasts which is to be undertaken at Edinburgh University by Professor M. M. SWANN of the department of Zoology, and Professor C. H. WADDINGTON of the department of animal genetics. This implements the policy, discussed last year in the Foundation's Thirteenth Annual Report, of stimulating interest in the study of fundamental problems which may have a bearing on rheumatism.

Bristol University—At a meeting of Council in July 3 Dr. P. W. BOTHWELL was appointed lecturer in public health, Dr. N. G. SANERKIN in pathology, and Dr. D. G. H. SYLVESTER, medical officer-in-charge of the students' health service.

Royal Photographic Society—The Society's combined colleges bronze medal and a certificate are offered jointly every year by The Royal College of Surgeons of England, The Royal College of Physicians of London, and The Royal College of Obstetricians and Gynaecologists for an outstanding example of photography in the service of medicine and surgery. Any person of any nationality, whether a member of The Royal Photographic Society or not, may compete or may be nominated for this award. Names and supporting evidence must be submitted to the Hon. Secretary, Medical Group, Royal Photographic Society, 16, Princes Gate, London, S.W.7., by November 30.

William Harvey Centre—A new maternity, child welfare, and school treatment centre at the L.C.C.'s Ashburton estate at Roehampton was opened by SIR CHARLES DODDS, F.R.S., on July 20. Harvey spent the last years of his life at Roehampton, in a house not far from the Centre, and died there in 1657.

Buswell Fellowships—The University of Rochester School of Medicine and Dentistry announces a series of Buswell Fellowships for graduates of approved medical schools who wish to carry out research there. The object of the Fellowships is to assist well qualified doctors to prepare for academic careers. Junior fellowships carry a basic stipend of $4,500—$6,000 a year, senior fellowships $5,500—$8,000. Applications will be received at any time. Further details and application forms are obtainable from DR. L. E. YOUNG, University of Rochester Medical Center, 260 Crittenden Boulevard, Rochester 20, New York.

Royal College of Surgeons (Eng.).—At a meeting of Council on July 9, the following elections were made for the ensuing year: *Hunterian Professorships*: N. C. TANNER, S. O. AYLETT, H. W. BURGE, H. H. EDDEY, R. G. ROBINSON, H. H. NIXON, J. C. WATTS, P.K. DURAISWAMI, A. H. C. RATLIFF, J. D. GRIFFITHS, W. J. METCALFE, K. BLOOR, R. L. HUCKSTEP, J. H. HOVELL, A. E. JONES. *Arris and Gale Lectureships*: N. R. BARRETT, J. H. PEACOCK, R. M. H. MCMINN. *Joseph Henry Lectureship*: L. GILLIS. *Erasmus Wilson Demonstratorships*: J. B. ENTICKNAP, L. W. PROGER, H. G. H. RICHARDS, M. O. SKELTON, A. G. STANSFELD, J. R. B. WILLIAMS. *Arnott Demonstratorships*: J. DOBSON, A. A. BARTON, S. ENGEL, D. H. TOMPSETT, B. D. WYKE, D. G. WALKER.

F.R.C.S. (Edin.).—At a meeting of the College on July 10, the following candidates who passed the requisite examinations were admitted Fellows:

A. A. B. BAILEY, K. A. BOULTON, W. S. BSAISO, T. CARTMILL, P. B. CHAKRABARTY, B. D. COOTE, J. CORMIE, A. P. CRAWFORD, C. M. DAVIDSON, R. B. DOUGLAS, F. DUFF, M. M. EL AZMEH, J. EYTON-JONES, G. D. FORSTER, N. V. FREEMAN, R. K. GARG, N. K. GUHA, J. A. W. HARDING, R. J. HARRIS, M. M. HIFNY, K. H. JAGASIA, P. C. KOTHARI, R. KUMAR, R. C. K. LOH, P. MAJUMDAR, S. R. K. MALIK, K. S. MEHDIRATTA, T. MICHAELIDES, J. E. MOULTON, A. K. MUKERJEE, S. K. MURTHY, A. B. NANDI, A. PAUL, K. PURUSHOTHAMAN, S. S. RAO, A. M. RIAD, I. S. ROY, H. N. ST. JOHN, H. G. I. SHANKS, V. N. SHRIKHANDE, S. VAN DER SPUY, J. S. STOREY, C. K. SWALLOW, G. E. M. THOMAS, J. S. WALIA, M. O. WOO-MING, L. L. WILLIAMS, and H. K. F. WILSON.

Institute of Diseases of Chest—Clinical demonstrations, free to medical practitioners, will be held on Fridays at 5.0 p.m. during August in the Institute's lecture room (the grounds, Brompton Hospital, Fulham Road, S.W.3).

London School of Hygiene and Tropical Medicine—Wholetime course in occupational health, September 29 — December 11, short course for general practitioners, September 28 — October 3, to be held at the School. Details from DR. R. S. F. SCHILLING, at the above School, Keppel Street (Gower Street), London, W.C.1.

International Symposium on Inhaled Particles and Vapours—To be held in Oxford by the British Occupational Hygiene Society, March 29 — April 1, 1960. Details from DR. J. S. MCLINTOCK, Medical Service, National Coal Board, Hobart House, London, S.W.1.

Birmingham University—Symposium on "Disordered Pulmonary Function", October 23, 24, at Queen Elizabeth Hospital, Birmingham, 15. Details from Chairman, Board of Graduate Studies, Medical School, Birmingham, 15, or final advertisement page *Journal*, July 4).

Ministry of Health Courses—Courses for orthopædic consultants, October 5-9, and physical medicine consultants, November 4, 5, will be held at Roehampton House, Roehampton, London, S.W.15. Details from DR. T. RITCHIE, Artificial Limbs and Appliances, at that address.

Journée de Réanimation Médicale—To be held by the Hôpital Necker and the Centre National de Transfusion Sanguine, October 6. Details from DR. J. CROSNIER, Hôpital Necker, 149, rue de Sèvres, Paris.

Any Questions?

Uric Acid Level in Pre-eclampsia

Q.—*What factors produce a rise in the level of blood uric acid? Is it a reliable indicator of the severity of pre-eclampsia?*

A.—Uric acid is an end-product of the breakdown of the nucleoprotein component of cell nuclei and is also a derivative of muscle hypoxanthine. It is possibly destroyed by the liver, and is certainly excreted by the kidneys. The level of uric acid in the blood may be raised in the following circumstances: (1) Any state of nitrogen retention (uraemia). This is typically caused by impaired renal function associated with any renal disease, or with a reduced blood flow through the kidneys. The uric acid level also rises in dehydration uraemia—such as might be seen with hyperemesis gravidarum. (2) In convulsive states. In eclampsia the blood uric acid rises by approximately 1 mg.% for every fit, up to a maximum reading of 10 to 12 mg.% (average normal=4.2 mg.%). A similar phenomenon is seen immediately following the fits of epilepsy, and after convulsions induced in non-pregnant individuals by means of E.C.T. or insulin. The change in eclampsia is therefore not likely to reflect liver damage (as has been postulated) but rather excessive muscular activity. In this connexion it is also suggested that the uric acid content of the blood can increase after strenuous physical exercise by non-pregnant individuals. (3) Parturition. The amount of uric acid in the blood rises in proportion to the length of labour. This may be the result of muscular activity or of diminished urinary output. (4) Liver damage. Certain types of liver necrosis—e.g., that seen in chloroform poisoning.[1] This is possibly because the damaged liver fails to destroy uric acid and may be the result of the breakdown of liver cells with the release of nucleoproteins. (5) Metabolic disorders such as gout. (6) Excessive cellular destruction within the body, as in diseases such as pneumonia, leukaemia, and polycythaemia. This may only operate if the excretory function of the kidney is defective. (7) A high intake of foodstuffs rich in nuclei or in purine bases or in methyl purines—e.g., liver and kidney, meat extracts, tea and coffee—in association with impaired renal function. (8) Toxaemia of late pregnancy. A rise in the uric acid level has long been regarded as the most constant biochemical change associated with pre-eclampsia and eclampsia and is still so accepted.[2-6] It has generally been assumed that it is a manifestation of liver damage, and some writers say that the rise is so specific that it is of diagnostic and prognostic value.[4] However, Crawford[5,6] showed clearly that the findings do not always tally with the clinical assessment of the severity of the disease, nor with the subsequent progress of the patient. Even if the level of uric acid in pregnancy toxaemia generally reflects the clinical severity of the disease, there are many exceptions, and a pre-eclamptic woman with a normal amount of uric acid in the blood can develop eclamptic fits within a few hours. Moreover, a rise in blood uric acid in toxaemia may have several explanations—as will be clear from the many relevant factors enumerated above.

The conclusion is that any elevation in the blood uric acid level in toxaemia is dependent on so many variables that it cannot be used as a means of diagnosis or prognosis unless care is taken to distinguish between the states of pregnancy, labour, and the puerperium, unless all the possible causal factors are analysed, unless it is interpreted in relation to other clinical and biochemical findings—e.g., urinary excretion, blood urea levels, etc.—and unless the method of its determination is known to be accurate.

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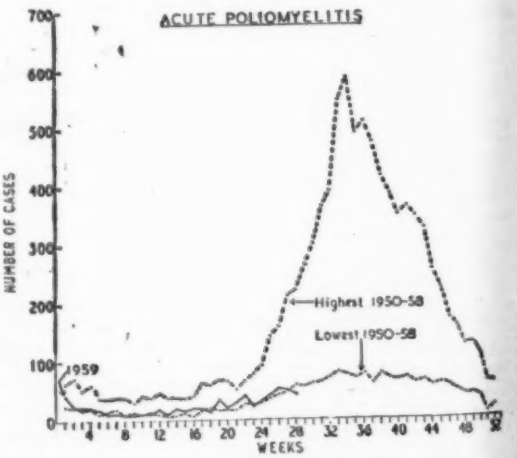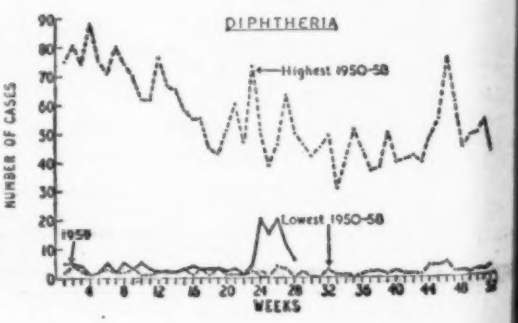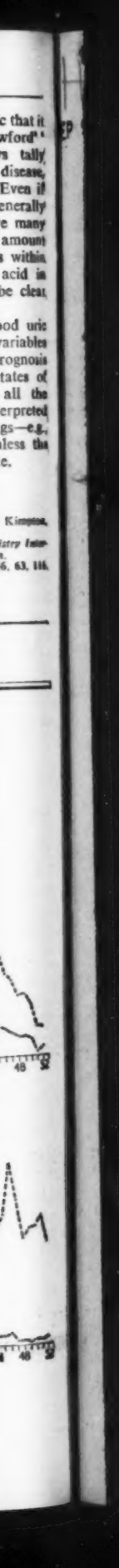
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